The CHEMICAL AGE

VOL LX 18 JUNE 1949 No 1562

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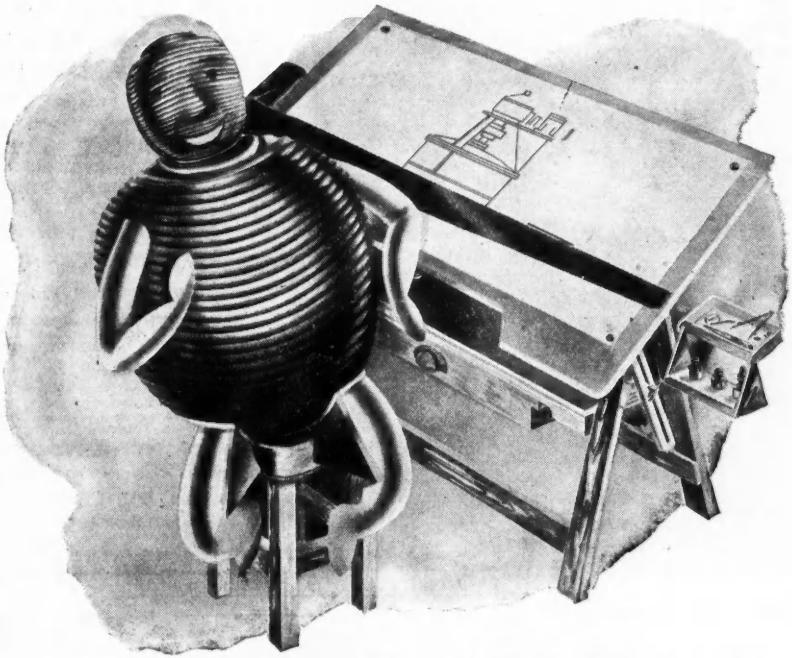

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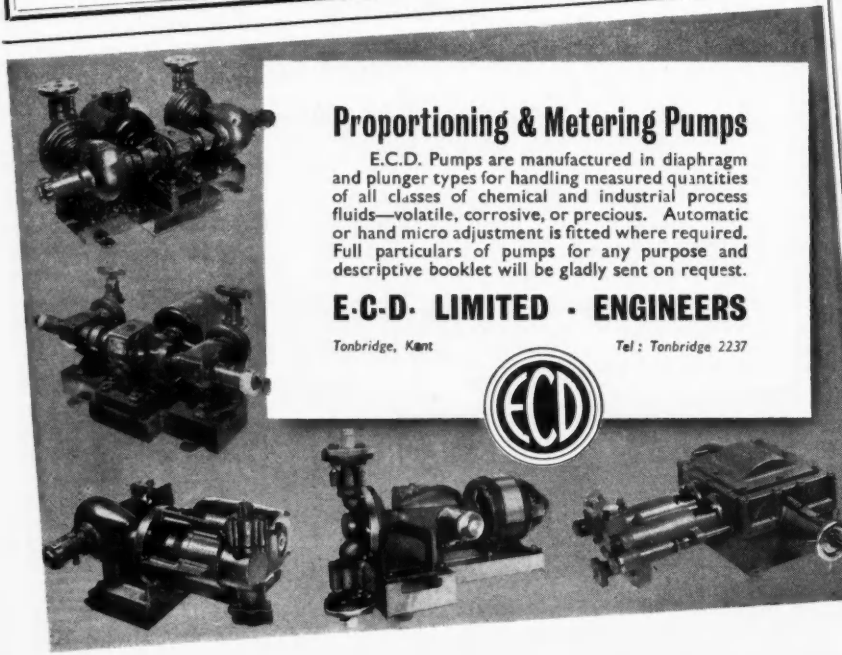

The Chemical Age

A Weekly Journal Devoted to Industrial and Engineering Chemistry

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THE CHEMICAL AGE offices are closed on Saturdays in accordance with the adoption of the five-day week by Benn Brothers, Limited

VOL. LX
No. 1562

18 June 1949

Annual Subscription 30s.
8d. per copy, post paid, 10d.

Germany's Fischer-Tropsch Plants

THE resistance to the dismantling of four of the six Fischer-Tropsch synthetic oil and chemical plants at Dortmund-Hoesch, Bergkamen, Castrop-Rauxel and Wanne-Eikel, which has been in the news in the last few days, is not by any means the first instance of resistance by the Germans to dismantling of plant destined for reparations or destruction under the disarmament programme. It will be remembered that the strike at Kiel last year was settled only after considerable difficulty, but it is true to say that this is the first instance in which physical resistance, if only of the passive sort, has occurred.

The resistance is symptomatic of the revival of German national self-confidence and urge to self-assertion, but should not be described as "nationalism," because the meaning of that word has become perverted. It is, in fact, a natural feature of the moral recovery of the German people under treatment by the occupying powers since they removed the cancer from its "body politic" four years ago. The Germans are far from understanding, and still further from adopting, the democratic principles with which the free nations are attempting to inoculate them, and the German characteristics which we have learnt to know so well are reappearing. They feel to-day sufficiently sure of themselves to offer resistance to any action on which they think there is a sufficient difference of opinion between the occupying powers to give them a chance of success.

The Fischer-Tropsch plants were erected to operate processes which resulted from brilliant technical research and were an important item in the Goering "Self-sufficiency Plan." It was never supposed nor claimed that they were a normal economic development nor that their products could compete in cost of production with the imported natural materials. The research was undertaken and the plants erected in order: (a) to save limited foreign currency resources to pay for the import of the raw materials of munitions of war, and (b) to provide oil, fuel and fatty acids when import became impossible on the outbreak of war. They were conceived primarily as a war measure and as such are a legitimate item in the disarmament programme.

It is paradoxical that two of the plants were last year once more put into operation to conserve slender hard currency credits, required to pay, in this instance, for essential imports of food and raw materials for peacetime manufacture. The decision was also influenced by the world shortage of fatty acids at that time and the urgency of increased soap production in Germany. The present state of affairs is radically different; imported fatty acids are in free supply and soap can be bought freely in the German shops. The phenomenal increase in German exports since the autumn of 1948 has provided hard

On Other Pages

currency resources to an extent which could not have been foreseen even so recently as nine months ago.

The Fischer-Tropsch plants are scheduled for dismantling because the embargo on the production of synthetic oils and fuels was upheld under the Washington Agreement, and the dismantling was, therefore, a disarmament and not a reparation measure. The plants will not be sent abroad and reassembled for the benefit of another country, as the Germans appear to think and certainly argue, although certain general purpose machines and plant items may well be sold to countries which have need of them.

The argument has been advanced by the Germans that the coal used in the Fischer-Tropsch process was useless for any other purpose and, in fact, a waste product of the mines. This is not so. The types of coal suitable for the process require careful selection in relation to the intended products, but are eminently suited for use in the gas and other industries. It is also argued that the cessation of the present production of fats (no oil or fuel production has been permitted) would cause unemployment and dispersal of technical skill and knowledge, but seeing that skill and knowledge have been devoted to the production of materials greatly inferior to the natural fatty acids now in reasonably free supply, and at an utterly uneconomic cost, this argument appears to be quite irrational. It is true that some unemployment will be caused and that there is some general unemployment in Western Germany, but the latter is of a temporary character and due to the lack of working capital in industry. This purely financial matter is being dealt with by carefully considered measures of Military Government, and there is, in fact, owing to war casualties, a shortage of technicians and skilled labour for the industrial production which will result when the monetary mechanism has been readjusted. Reabsorption of the unemployed within the next few months will certainly not present any difficulty.

From the political point of view it is regrettable that two of the plants were put into operation early in 1948 for the reasons given above, but the political repercussions could hardly have been foreseen at that time. It is to be hoped that the occupying powers will stand firmly and that these plants, so useless to the development of German industry for peaceful co-operation in the recovery of Western Europe will, in fact, continue to be dismantled, but the question has unfortunately ceased to be economic and has become a political issue. The fear has been expressed that the result will be a tacit armistice after a nominal withdrawal of German resistance.

NOTES AND COMMENTS

Cheaper Solvents

THE lifting of Government control of distribution and price levels of a gradually widening range of chemical materials is perhaps one of the most convincing testimonies industries or individuals can have that national trading conditions must at long last sweep away all the artificial restraints under which productive enterprise has laboured now for nearly ten years. Best of all is the gradual banishing of the old bogey that only the firm hand of the Government on the reins keeps industrial materials from soaring to price levels beyond the reach of some sections of industry. A very strong case for the opposite view is contained in recent experience of tardy and not over generous price reduction of State administered non-ferrous metals and in a number of contrasting experiences, to which the latest happenings in relation to widely used industrial solvents forms an effective example.

No Time Lost

ON the first of this month the Board of Trade relinquished control of ethyl alcohol, acetic acid, acetic anhydride and butyl alcohol by the terms of the Molasses Order, 1949. From that day the principal makers and distributors abated the price of butyl alcohol by approximately 30 per cent. Simultaneously the decision was taken to make large reductions in charges for the acetates, which had effect on Monday this week. When all due allowance is made for the fact that the latest molasses legislation recognised that shortages had been overcome, there are good grounds for believing that this relief to user industries would have come very much earlier if left to the traditional abitration of supply and demand. The need for reductions in the export prices of finished products was heavily underlined at the BIF and the whole subject of price maintenance is now being critically examined under Government auspices. Sir Stafford Cripps or the President of the Board of Trade—or both—would do well to subject some current departmental policy to the same critical scrutiny.

Shared Fruits of Research

AN apposite commentary on recent allegations "that profit-making private firms" do not share the results of their scientific research (THE CHEMICAL AGE, Leader, *60*, 845-6) was offered by the exhibition of its publications held by Imperial Chemical Industries at the Grosvenor Hotel, London, this week. Sir Frederick Bain, opening the exhibition, said that it had originally been intended for employees but "recent observations by prominent men have made it clear that it is I.C.I.'s duty also to see that the public are informed, so as to counteract the impression which is being sedulously fostered that free industry is doing little or nothing to promote scientific knowledge." In fact the company spent £4 million last year on research and employed a staff of more than 2000 scientists and technologists whose knowledge was made available to science, industry and the world in general. *Endeavour*, in the eight years of its existence, had come to be regarded as one of the leading scientific journals, as the need to publish it in French, German, Italian, and Spanish editions testifies. Each division published its own literature and there were some 1000 different titles in the 759 publications published in a year; these ranged from leaflets intended only for keeping in a loose-leaf binder until replaced by later information to volumes of several hundred pages. All these publications, admirably produced by the Kynoch Press (over two million copies were printed in 1948), are available to industry, universities, museums, embassies, libraries, technical institutes, research foundations and others. In addition, when the I.C.I. specialists gained valuable information which was considered worthy of a larger field, the manuscripts and data were passed to recognised publishing houses. When to all this ample literature is added the widening supply of specialised films—technical, medical, veterinary and agricultural, and school science—the I.C.I. contribution to the common store of knowledge is about as ample as that of any existing research oganisation, not excluding the prolific DSIR itself. It is to be

hoped that many will have availed themselves of this opportunity to see, not how little, but how much science and industry are indebted to private enterprise for sharing the results of research.

A New Vocabulary

WHILE chemical engineering itself remains unprovided for in some universities' curricula it would be little short of miraculous if the newer science of automatic control systems were not wrapped in an obscurity which for many represents the equivalent of a jungle in which there are a few knowledgeable guides, but no maps. The incomplete understanding of some of the new and admittedly complex mechanisms which can control and regulate an increasing number of chemical processes, and sometimes permit the abandonment of uneconomical batch methods, was recently deplored by an expert (THE CHEMICAL AGE, *60*, 628-30), the validity of whose complaint is tacitly acknowledged by what the British Standards Institution is now doing to set up a standard vocabulary. In an appreciation in *Nature* of the first of the four manuals (No. 2) which are to provide a "Glossary of Terms used in Automatic Controlling and Regulating Systems" R. H. Macmillan gives an ample impression of the magnitude of the task of clearing away the uncertainty and occasional contradictions in terminology used in process control, with which No. 2 is concerned, position control, automatic regulators and closed-loop servo systems. Each department has to a large extent developed its own terminology without much reference to usage in the others, which goes far towards excusing what the writer calls "the aura of mystery which surrounds the whole subject of automatic control in the minds of many engineers." It is obvious that the hope that automatic principles will share some of the enlightenment to which chemical engineering is gradually approaching will be unfounded so long as the practitioners speak in different languages. As the writer in *Nature* points out, even terms as familiar in process control as "offset" have the Jekyll and Hyde-like propensity of turning up in the allied sphere of position control as "steady state of error." The prevalence of something of the same state among some operating staffs is not entirely to be wondered at.

Few Recent Additions to World Oil Reserves

OIL is an essential to modern civilisation, and increasing consumption raises the problem of the quantities of crude oil reserves in the world and the possibility of exhaustion, for despite an increase in proven reserves during the last 14 years, it must be recognised that crude oil is a "wasting asset."

Estimated proven reserves of crude oil (in million barrels) at the beginning of 1949 were given as: U.S.A. 23,280; world, 78,322, compared with U.S.A. 12,177 and world 22,000 in 1935. Of the world total in the current year, over 40 per cent is contained in the Middle East. The figures of U.S.A. reserves exclude condensates and natural gas liquids, which at January 1, 1949, were 26,821 million barrels.

Calculations of proven reserves—states the Petroleum Information Bureau—are always conservative; there is almost always more oil in areas tested, but not yet producing, than experts, for lack of accurate date, will admit as "proven."

The possibility of fewer new supplies in the foreseeable future is suggested by experience in the following regions:—

U.S.A.—Since the 1860's the United States has led world oil production and has been large exporters, but there have been no major U.S. oilfields discovered for 15 years, with the possible exception of the new West Texas field (1947). Further, there has been no outstanding increase of production from greater depths. The total of U.S. proven reserves is still rising, but consumption is rising faster.

Europe (excluding U.S.S.R.).—Despite discoveries in Central Europe in pre-war years and more recent discoveries in the Netherlands, European production, owing to the steady decline in Rumanian output, is not now rising.

East Indies.—There were no new discoveries of note in the Netherlands East Indies for many years, in spite of intensive exploration. The recent discovery of oil in New Guinea and the marked increase in production from the Seria oilfield in British Borneo, however, encourage the hope that further discoveries may yet be made.

THE FAWLEY REFINERY PLAN

£37 Million Addition to Home Oil Sources

THE projected new oil refinery, at Fawley, near Southampton, of the Anglo-American Oil Co., Ltd., is essentially an expansion of an existing plant, but so great is the expansion that it may be considered substantially a new venture.

The purpose of the enlarged plant is to help provide the considerable capacity which is necessary to handle the increased volume of crude oil which is being made available from the Middle East. To transport this crude to the U.S.A. and to bring back refined products to the United Kingdom would obviously be most uneconomic.

The additional capacity which will be provided will make it possible to refine locally a substantial part of Britain's requirements of petroleum products, thus reducing imports which, in the main, have at present to be paid for in dollars. In full operation, the output will be equal to about 25 per cent of the present total output in the United Kingdom.

The new refinery is designed to handle 110,000 barrels of crude oil daily (7½ barrels equal one ton). Fawley will thus be the largest single refinery project in the United Kingdom, and in fact Europe.

Some 5.5 Million Tons

The major influence leading to the choice of Fawley as the location of the new plant was an economic one, the cost of transportation and distribution from there being favourable. The marine facilities of this site weighed heavily in making a decision.

The plant will be exceeded in size only by a few of the very largest U.S.A. refineries. Abadan in the Middle East and Aruba in Venezuela are larger, each being in fact about four times as large as Fawley. (The Abadan refinery is the largest in the world, and Aruba second largest).

The total volume of products, it is anticipated, will be about 5.5 million tons a year. At the start, exports are not envisaged, but it is hoped that overseas sales may be possible to some extent in the future. To begin with, however, it is expected that the total output of the expanded Fawley refinery will be needed by the United Kingdom.

In round figures, the project will cost approximately £37.5 million. It should be noted that no ECA dollars are involved. Fawley is a private enterprise project intended to further the programme outlined in the "Economic Survey for 1949."

The new refinery will substantially reduce Britain's dollar expenditure for petroleum products and thus will be of particular significance to the national economy. It will permit greatly increased shipments of crude petroleum from the Middle East.

It is understood that the major portion of the refining plant be obtained from the U.S.A.; in any case, the whole of the catalytic cracking plant will come from there. This is dictated by the need for speed of delivery, as it is hoped that initial operation of the units will be accomplished by the end of 1951, which would not be possible if orders for the plant were placed in this country. Work on the construction has already commenced.

The Plant

The degre of dependence upon the U.S.A. will be controlled by the firm's strong desire and urgent need to have the refinery in operation at the earliest possible moment. It is thought likely that a good deal of the construction materials and ancillary equipment will be supplied by United Kingdom firms.

The main plant units will comprise two pipe stills, a catalytic cracking plant and its light ends facilities, an Edeleanu plant (sulphur dioxide treating of kerosene and gas oil), and other treating and sweetening plants for motor spirit. The catalytic cracking plant will be of the most modern design for making the maximum amount of petrol. It will take gas oil as feed stock and 50 per cent of the output will consist of good quality petrol.

Chemical Possibilities

The Fawley plant will not initially be engaged at all in the petroleum chemicals industry, but this is at present under consideration by the company. Thanks to the existence of the catalytic cracker, there will be unsaturated gases available, those gases from petroleum treatment being the starting materials for the manufacture of a group of products known generically as "chemicals from petroleum."

The latest devices to minimise air and water pollution will be installed. No sulphuric acid and its attendant fumes will be involved in the refining processes, which are stated to represent a very big advance in petroleum refining technique.

The U.S. organisation most prominently identified with the work being done at Fawley is the Foster Wheeler Corporation. This will supervise much of the process work and erection of the refinery units. In this it will make use of the local resources of its affiliate, Foster Wheeler, Ltd. Some of the work will be carried out by subcontractors.

Phosphate for Australia

Safeguarding Christmas Island Sources

IMPLEMENTING the plans to intensify Australian phosphate production, the Federal Government is to introduce legislation shortly to ratify the agreement between the Australian and New Zealand Governments for the purchase of phosphate leases on Christmas Island in the Indian Ocean.

The Australian News and Information Bureau, New York, reporting this, states that the sum involved is nearly £2.4 million. The British Phosphate Commission will operate the deposits on behalf of the two Governments.

The phosphate concession has been held since 1897 by a private British company, the Christmas Island Phosphate Company. The deposits are considered to be the largest in the world, with the exception of those at Nauru Island, which are also worked by the British Phosphate Commission.

The Federal Government is also working on a long-range plan to transfer natives from Nauru to another island in the Pacific, as work on the extraction of the phosphate deposits on the island will eventually reduce it to a series of coral pinnacles. Altogether, 1 million tons of phosphate are being exported every year.

Other plans are also being considered to deal with Australia's great consumption of superphosphate. One is the building of a sulphuric acid plant at Port Adelaide in South Australia within the next two years, at an estimated cost of about £2 million. Annual production of superphosphate in existing South Australian plants totals 260,000 tons, which is 30,000 tons less than the State's requirements. The State Government of South Australia is also considering a proposal to make use of a German method of producing sulphuric acid from gypsum, with cement as a by-product.

ARGENTINE PENICILLIN

ARGENTINA'S first pharmaceutical plant, primarily designed for large-scale production of penicillin, was completed last week, according to a statement by E. R. Squibb & Son, New York, the company which designed and built the $4 million installation. All the capital was provided in Argentina. The new drug centre consists of four buildings covering 78,447 sq. ft. In addition to penicillin, the plant will yield other drug and biological products for use by Argentina's 16 million population.

Fertiliser and Yeast Projects

Ceylon Plans Home Production

TWO plans to effect large economies of import expenditure in relation to chemical products are engaging the attention of the authorities in Ceylon. The possibility of including a large-scale fertiliser plant in the industrial development programme being carried out at Gal Oya, in the south is being studied by the Island's Minister of Industries, Mr. G. G. Ponnambalam, who is awaiting the report of experts, particularly regarding the prospects of securing an adequate supply of producer gas by carbonising local wood or peat.

The establishment of a fertiliser plant in Ceylon, it is estimated, would prevent the annual outflow of Rs.20 million. This estimate is based on Ceylon's annual requirements of 80,000 tons of ammonium sulphate, the standard natural fertiliser used in Ceylon. The manufacture of ammonium phosphate, which is regarded as a more suitable fertiliser particularly for the dry zone of the island, would also be undertaken by the new project.

The other aspect of import saving are connected with the investigations now being carried out by the Medical Research Institute of Colombo to assess the possibilities of extracting yeast as a by-product of the Government distilleries. First observations have proved so hopeful that the institute has ordered equipment from abroad, chiefly from the United Kingdom, to complete the investigations and later to promote the production of yeast in sufficiently large quantities to meet the demands of the island. Nearly all the yeast now consumed in Ceylon is derived from overseas.

FLOURINE DAMAGE

A TWENTY-YEAR research plan, in which Prof. W. H. MacIntire, University of Tennessee, has played an active part, has reinforced existing evidence that fluorine in the air can render grass and hay toxic to animals and damage crops.

Twenty-nine industries, including aluminium and phosphate fertiliser manufacture, are stated in a report to the recent 115th national meeting of the American Chemical Society to release into the atmosphere small amounts of highly corrosive fluorine compounds "strong enough to etch glass."

Two of the richest food-producing areas in Tennessee are said to have been rendered unfit for profitable livestock and dairy farming since the expansion of the local aluminium industry and the increase of thermal processing of phosphate rock.

Cheaper Metals and Oxide

Copper, Lead and Zinc

FURTHER reductions in the prices of non-ferrous metals, as from June 10, have been announced by the Ministry of Supply. Comparative prices (per ton delivered) are :—

	New Price £ s.	*Old Price* £
Electrolytic copper	117 10	130
Good soft pig lead	82	95
Good ordinary brand zinc	78	85

Discounts, premiums, and the Ministry's buying price for rough copper in slabs of from 2 cwt. to 3 cwt. remain unchanged.

The prices per ton of zinc oxide are also reduced, as under, for lots of not less than 2 tons, delivered buyers' premises :—

	New Price £ s.	*Old Price* £ s.
Red Seal	75 15	81 15
Green Seal	77 5	83 5
White Seal	78 5	84 5

This is the second series of reductions in non-ferrous metal prices in a month, the last being announced on May 14 (THE CHEMICAL AGE, *60*, 745).

The price of zinc in New York was on June 9 cut by a further ¼c. to 9½c. per lb., East St. Louis. The reduction on June 8 of ¾c. failed to stimulate demand, and it is thought that the metal will become still cheaper before this is achieved, states *Comtelburo*.

ZINC SALVAGE SCHEME

MILLIONS of dollars' worth of zinc, in a pile of metal-bearing plant residue at Flin Flon, a mining town in Northern Manitoba, Canada, will be salvaged with the help of specially designed equipment now being built by the Babcock & Wilcox Company for the Hudson Bay Mining and Smelting Co., Ltd., which will use it in connection with the fuming process for treating reverberatory slag containing zinc from copper concentrates and zinc plant residue. The copper-zinc ore, with precious metals of gold and silver and smaller amounts of cadmium, selenium, and tellurium, is being mined at Flin Flon. The zinc residue from the zinc leaching plant, containing amounts of zinc, copper, cadmium, gold, and silver, has been continuously accumulated by the company since 1930 and is now estimated to total nearly 800,000 tons.

New Solvents Prices

Large Reductions in Three Categories

FOLLOWING the recent announcement by the Board of Trade (THE CHEMICAL AGE, *60*, 780) that ethyl alcohol, butyl alcohol, acetic acid and acetic anhydride have been removed from control as from June 1, it is understood that reductions in price are being made by the principal manufacturers in respect of butyl alcohol, butyl acetate, ethyl acetate and amyl acetate.

The new basic prices, compared with the previous rates, for quantities of 10 tons are (per ton) :—

	New	Old
Amyl Acetate technical ...	£171 10s.	£173 10s.
Butyl Acetate BSS	£149 10s.	£185 10s.
Butyl alcohol BSS	£145 10s.	£188
Ethyl acetate BSS	£103 10s.	£115

These prices, quoted by A. Boake, Roberts & Co., Ltd., last week, are net, delivered into buyer's factory in returnable drums. Allowances are made from these prices when delivery is taken in tankers.

The new price for butyl alcohol came into force on June 1, and the new prices for the other solvents operate as from June 13.

MONAZITE PROSPECTS

THE new survey of minerals in Ceylon includes the monazite sands along the west coast of the island. Field investigations on these deposits have almost been completed, and the Government mineralogist's department is awaiting new equipment from Britain to conduct laboratory tests on the collected concentrates from the beach sands. These inquiries follow the investigations that were made from 1903 to 1908.

Interest in radio-active minerals, including uranium and thorium, has been resuscitated by the British Government's offer to the Colonies to purchase standard quality stocks of these at standard prices. Although this offer was made to the Colonies, Ceylon would offer any available stocks to the United Kingdom.

Investigations have revealed that there are further deposits of thorium in the Ratnapura district of the island.

Meanwhile, India is to set up a State enterprise to extract the thorium from the monazite sands which abound on the coast of Travancore State in South India. Three members of the Indian Atomic Commission, including its chairman, Mr. H. J. Bhabha, are to be on the board, and two French firms have been given a 15-year contract to exploit the sands, which bear cerium as well as thorium and other rare earths, and instal a plant.

Basic Chemicals in March

Little Change in Production and Consumption

PRODUCTION and consumption of basic chemicals in March were maintained at much the same levels as in February, while stocks generally showed a slight improvement. Sulphuric acid production in April was lower than in the previous month, but was still higher than in April, 1948, while compound fertiliser production again increased.

Total estimated numbers employed in the chemical and allied industries during March were marked by a small increase over the previous month being (in thousands) 432.6 distributed as follows:—coke ovens, chemicals and dyes, explosives, etc., 251.2 (184.3 men, 66.9 women); paints and varnishes 38.9 (37.2 men, 26.2 women); oils, greases, glue, etc., 64.0 (50.8 men, 13.2 women); pharmaceutical, toilet preparations, etc., 79.6 (40.7 men, 38.9 women).

These figures and the representative tables given below are taken from the last issue of the *Monthly Digest of Statistics* (No. 41, May).

	March, 1949 Thousand Tons			March, 1948 Thousand Tons		
	Production	Consumption	Stocks	Production	Consumption	Stocks
Sulphuric acid	139.2*	156.0	—	129.0*	135.0	—
Sulphur	—	24.7*	72.3*	—	21.4*	88.6*
Pyrites	—	20.6*	76.0*	—	20.6*	81.0*
Spent oxide	—	15.9	168.0*	—	16.4*	167.0*
Molasses (cane and beet)	9.5	20.9†	265.8	8.9	20.4†	205.0*
Industrial alcohol (mil. bulk gal.)	1.44	2.12	5.6	1.36	2.61	6.98
Superphosphates	22.2	36.7	—	20.5	33.6	—
Compound fertiliser	186.8	288.3	—	185.4	297.1	—
Liming materials	—	466.1	—	—	313.9	—
Ammonia	—	6.88*	5.21	—	6.33*	5.26
Phosphate rock	—	99.8	147.0	—	90.9	178.5
Virgin aluminium	2.78	16.1	—	2.72	14.7	—
Virgin copper	—	34.2	99.4	—	29.6	97.5
Virgin zinc	—	19.6	41.6	—	18.8	34.4
Refined lead	—	18.3	23.7	—	17.4	40.3
Tin	—	2.17	21.0	—	2.46	14.6
Zinc concentrates	—	13.5	33.0	—	14.1	58.0
Pig iron	255.0*	—	243.0*	247.0*	—	177.0*
Steel ingots and castings (including alloys)	305.0*	—	1,031.0	294.0*	—	780.0
Rubber: Reclaimed	0.44	0.43	4.0	0.51	0.59	3.68
Natural (including latex)	—	4.28	47.5	—	4.52	137.1
Synthetic	—	0.05	1.87	—	0.06	2.01

*April †Distilling only

Reported Targets of Czech Chemical Industry

TWO main factors are influencing the Czech chemical industry, the 1945 nationalisation programme and the two-year plan. Particularly since 1948, state control has been reinforced, and at the moment there is no more than 8 per cent of commerce and industry in private hands. In 1945, 94 of the largest chemical companies, representing 12 per cent of the total production, were dispossessed.

The principal oil refineries suffered major war damage, and attention is being concentrated on productions considered of first economic importance, such as sulphuric acid, alkalis, manures, carburants and artificial textiles. Exports mainly consist of tar and its distilled products, citric and formic acid, titanium white, potassium permanganate, zinc, lithopone and varnish.

According to official statements which have been issued in Czechoslovakia, the two-year plan, should raise agricultural production to pre-war level, and industry should reach between 110 to 150 per cent of 1937 production. Superphosphate production has increased to 190,000 tons and nitrogen manures to 220,000 tons. The latter figure was 80,000 tons less than the Government programme, and a supplement of 100,000 tons was envisaged for the start of 1949.

The plan envisages 205,000 tons of sulphuric acid, 102,000 tons of soda carbonate, 6,800 tons of artificial wool, an increase of 69 per cent in production of synthetic carburants from native raw materials, 130 per cent of mineral lubricating oils and 60 per cent more benzol.

The chemical industry is to increase its personnel by 12,300. Investments envisaged by the plan amount to 25.38 milliard crowns.

INDUSTRY IN THE BIZONE

German Records for Calcium Carbide and Aluminium

A MAJOR industrial event in the bizonal area of Germany was the publication of the tripartite agreement on prohibited and limited industries and reparations.

During the first three months of this year raw materials have, on the whole, been adequate and imports are scheduled to cover immediate future requirements.

A return to more normal business conditions was noted with the easing of transport and communications, and of some importance were the changes in procedure which transferred a large share of responsibility for foreign trade from the Joint Export-Import Agency (JEIA), to German business men.

Industrial production in the bizonal area maintained the same daily rate as in the two previous months according to the *Monthly Report of the Control Commission for Germany (British Element)*, Vol. No. 4, April.

Uniform Movement

The movements of the individual industrial groups were fairly uniform in April. Nine of the 17 groups for which figures are available dropped between eight and ten per cent; these decreases closely paralleled the 9 per cent decline in the total index—reflecting the 10 per cent fewer days in April (24). Among the exceptions, stones and earths and petroleum and coal products gained, while non-ferrous metals, glass and ceramics, and vehicles declined less than the average. Only three groups dropped over 10 per cent; machinery and optical goods, leather and leather products, and rubber products.

The gain in stones and earths production was partly a seasonal rise and the re-activation of the oil refineries caused the rise in petroleum products.

The production of ingot steel continued at an increasing rate in April, when the average output per working day rose about 1000 metric tons, but total production dropped from 752,300 in March to 705,100 metric tons. The development in hot-rolled products was similar. The daily average output of pig iron also increased, although total output dropped slightly to 569,000 tons.

The non-ferrous metals industry operated in April at 78 per cent of the 1936 basic period level, as compared with 81 per cent in March. There was actually an increase in the daily rate of production.

Smelter production of non-ferrous metals declined with the exception of primary aluminium. The output of electrolytic copper was almost unchanged at 7400 metric tons, showing an increase in daily rate of production in spite of the slightly lower total. The smelter production of lead declined from 8400 metric tons in March to 7200 tons. The tight money situation coupled with the fall in metal prices has caused the accumulation of stock at lead and zinc smelters which makes production restrictions unavoidable.

Zinc Production

Smelter production of zinc, including zinc dust, dropped from 7700 tons in March to 7300 tons in April, a somewhat smaller decline than would be accounted for by the smaller number of working days in the month.

The production of primary aluminium at 2900 metric tons was the highest since the beginning of the occupation, as the two reactivated plants at Toeging (Land Bayern) and Luenen (Land Nordrhein-Westfalen) operated on schedule. This represents an annual rate of 34,800 metric tons.

There was a 9 per cent decline in production by the chemical industry in April, but the daily rate of production did not on the whole vary from that of March. With the recent improvement in the electric power situation, particularly in Land Bayern, marketing difficulties have become the industry's chief concern. Both domestic and export sales are meeting resistance, notably in the case of coal-tar dyes and pharmaceuticals.

Production of calcium carbide reached a post-war record of 43,000 metric tons, but output of other chemicals was slightly below the March totals. Production of sulphuric acid at 72,000 metric tons continued above the 1936 level. Its supply for nitrogen fixation and superphosphate production continued to be satisfactory.

Soda

The output of soda ash declined to 41,100 metric tons, and of caustic soda to 18,700 metric tons.

The production of nitrogen fertilisers increased slightly to 23,800 metric tons in April. The output of potash and phosphate fertilisers dropped to 50,900 tons and 22,300 tons respectively. Total output in April of coal-tar dyes fell from 1600 metric tons to 1200 tons. The production of paints, varnishes, and the manufacture of soap continued to rise, reaching 5100 metric tons, a

(*Continued at foot of following page*)

Price Cuts in Western Germany

Chemical Industries in Need of Dm 500 Million

INCREASING supplies in the face of limited absorptive capacity in some consuming trades have led to some price reductions for chemical products and industrial oils in Germany, and it is believed that the chemical industry, like others, will have to study efficiency in plant operation to meet changing conditions. This is particularly the case where increased output, which would permit fuller use of existing capacity, is dependent on rising coal supplies, which are not certain to materialise.

The easing of the supply position is reflected by the decontrol of phenolic plastics, polyvinyl chloride, phosphorus and phosphorus compounds, and it is expected that the control of soap will also be lifted soon. Fatty acid supplies are said to be assured until the end of the year, and selling difficulties have already occurred in the case of washing powders, production of which consequently declined in recent months.

Inquiries into the capital requirements of the West German chemical industry have led to a remarkable result. About 120 chemical firms have reported capital requirements of altogether Dm.500 million. Most of this sum is to be spent on capital expenditure this year, and during the next two years, but some schemes will not be completed before 1952 or even 1953.

Over 15 per cent of the total sum has already been expended, Dm.51 million out of the companies' own resources, Dm.7 million out of short-term credits, and Dm.28 million out of medium and long-term loans. Of the total of Dm.500 million the German chemical industry will not be able to meet much more than one-quarter from its own funds, and talks have been held with the German Reconstruction Bank concerning the financing of the remainder. About one-fifth of Dm. 45 million of investment credits to be released to German industries shortly is to be given to chemical undertakings.

Strong protests against the dismantling of coal oil and other chemical plants have been lodged by the interested companies themselves, local authorities and State Governments. Chemische Werke, GmbH, Huels, has drawn up a memorandum pleading for the exemption of a production of 30 tons of butadiene a month from the production ban, on the grounds that this would be sufficient to manufacture 1200 tons a month of thermoplastic material useful for floor covering, water-proof paper, water-proof paint and the textile industry.

Production of plastics on butadiene basis has been developed recently at Huels; at least Dm.5 million are said to have been spent so far on developing the new product and maintaining redundant staffs. The management at Huels has been endeavouring since the end of the war to change over to the manufacture of solvents, plasticisers and plastics.

The difficulties met by the German pharmaceutical industry immediately after the currency reform, when wholesalers and retailers cut down orders severely in an effort to get rid of their surplus stocks, have by now been largely overcome.

INDUSTRY IN THE GERMAN BIZONE

(*Continued from previous page*)

post-war record, whereas the output of washing powders fell sharply from 15,600 metric tons in March to 11,400 tons in April. Fats and fatty acids are in good supply.

Crude oil production continued to increase in April, reaching 64,400 metric tons as compared with an average monthly production in the previous six months of 58,400 tons, and well above the 1936 monthly average. The rise in April was contributed by the Emsland fields, Emlichheim and Georgsdorf (Lower Saxony), each of which is now producing over 9000 tons per month.

The refineries operated smoothly during April, and the output of finished products increased from 105,600 metric tons in Mach to 132,900 metric tons, almost double the monthly average for the period September, 1948—March, 1949.

COAL AND SALT PROSPECTS

THE best prospects for continued expansion of the Northumberland and Durham coalfield lie in the exploitation of undersea coal and of seams at greater depth than those worked at present. This is one of the theories examined in a survey of industrial facilities, published by the Northern Industrial Group.

Dr. John H. Jones, scientific adviser, Northern Divisional Coal Board, says it is clear that appreciable areas in West Durham will cease coal production during the next century, and that within 100 years the Durham coalfield will be dependent mainly on collieries of eastern and coastal areas.

According to the survey, only the fringe of the saltfield in South Durham and North Yorkshire, the limits of which are not known, has been exploited.

French Soap Process

Low-Temperature Emulsification

MODERNISATION of soap production was the subject of a recent lecture by M. Felix Lachampt, director of the Laboratoire de la société des Savons française.

He stated that if fats melted at as low a temperature as possible were treated by a suitable proportion of cold caustic soda (at 20° C.), but sufficiently concentrated (33 per cent NaOH), by means of a homogeniser an emulsion of lye could be obtained in which suspended particles are of 1 micron, giving a perfect contact of the two fluids over a considerable total surface. In these conditions there is a complete and almost instantaneous saponification when the emulsion comes into a heated zone—of 80°-100° C.—in a reaction tube.

The composition of the soap solution is as follows: combined fatty acids 65 per cent, combined soda 9.5 per cent, glycerine 6.5 per cent, free soda 0.3 per cent, impurities 1 per cent, water 17.7 per cent. "Liquidation" at 85° removes the salt from the soap which is then composed as follows: combined fatty acids 62 per cent, combined soda 9 per cent, glycerine 0.5 per cent, sea salt 0.5 per cent, water 28 per cent. The result is a good yellow soap with 72 per cent fat content without impurity or causticity.

Saponification by this process is stated to be much more rapid than in vats, the apparatus not being cumbersome or complicated. There is no great loss of heat and a saving of 250 kg. steam per ton of soap is possible. Finally, there is no loss of soap in the glycerine lye, which is easy to purify. The glycerine, of which only 0.5 per cent is lost, is at a higher concentration than that produced by other processes.

NEW SOAP MATERIAL

THE development of a new series of "multi-cleanser" soap substitutes, which are claimed to have powerful bactericidal action besides removing dirt, was announced in a recent report to the American Chemical Society. The new detergents can be used for surgical instruments and household utensils alike, it is stated. They are known chemically as morpholinium alkyl sulphates. These non-metallic and non-caustic products are described in the report as showing "remarkable chemical stability and compatability with other substances encountered in household use and in certain industrial processes."

New Source of Alcohol

Over 600 Tons from Citrus Waste

TWO newly established factories, built by the Assis Palestine Fruit Products Company for the production of alcohol and cattle fodder from orange residue come within the scope of the Government of Israel's plan to make full use of locally produced commodities.

Industrial alcohol has hitherto been imported into Israel. Now from six to eight tons of the spirit will be produced daily during the 100-day citrus season. That yield will cover about half the present local market demand. On an average, 300 tons of oranges are brought daily during the citrus season to the Assis factory in Ramat Gan—near Tel Aviv—where juice and concentrates are manufactured. From one ton—about 4000 oranges—some 300 litres of juice are pressed. Another 300 litres of liquors are extracted from the peel. These contain water and essential oils. The remaining peel and pulp are cut, crushed and dried and sold as cattle fodder. From each ton, one and a half kg. of essential oils are extracted, for use by manufacturers of sweets, liquors, soft drinks and medicines.

The machinery for the cattle fodder and alcohol production has in most cases been imported from the U.S.A. with the aid of the Palestine Economic Corporation.

ISRAEL'S RESEARCH PROGRAMME

A 12-MAN research institute has been set up by the Government of Israel to serve as the highest authority in the State for the co-ordination of research and the advancement of science. One of its tasks will be to find ways of increasing the scientific manpower of the country by training and by bringing scientists from abroad. Presiding at the opening meeting in his office in Tel Aviv, the Prime Minister, Mr. David Ben Gurion, said he envisaged the possibility of creating a World Jewish Academy for the Advancement of Science in Israel.

Prof. S. Sambursky, chairman of the council, stated at the initial meeting that contacts had been made with the various scientific and governmental institutions in the country as well as with organisations abroad and with UNESCO. Five committees have been appointed—for fundamental research (physics, chemistry, biology), agricultural, industrial, building and food research. Means to increase productivity will be particularly studied.

The council, with headquarters in Jerusalem, has a skeleton staff of paid officials, but the members are all unpaid.

MEASUREMENT OF RADIOISOTOPES

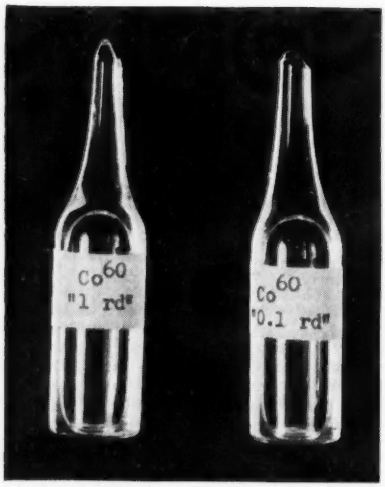
U.S. Recommendations for Gauging Emission Values

THE increasing number of uses of radioactive isotopes in biology, medicine, and industry make it important to determine accurately the number of radioactive atoms in a radioactive sample. That involves the use of recognised standards by which quantitative results and absolute measurements of different laboratories may be compared.

Detailed directions for use of radioactive standards and calibrated samples of radioisotopes issued by the U.S. National Bureau of Standards are given in a new 12-page pamphlet "Measurement of Radioactive Isotopes" (NBS circular 473, the Superintendent of Documents, U.S. Government Printing Office, Washington, 25, D.C.; 5 cents).

The publication reports that in correlating measurements of radioisotopes in different laboratories, the Bureau distributed identical samples of radioactive materials to approximately 40 hospitals, universities, and similar institutions. The range of values reported by these laboratories varied as much as 80 per cent from the average.

Because radioactive radiations are emitted equally in all directions, it is practically impossible to devise detecting equipment to record all of them. This and other difficulties encountered are discussed in some detail in the booklet, and directions are given for overcoming them. Among the topics treated are basic principles of measurement, units, the use of radioactive standards, preparations of working standards, and corrections for change in radioactivity with time.



Two of the radioactive standard samples of Co^{60} in sealed 5-ml ampoules, used to calibrate unknown solutions. They have certified gamma-ray activities, one 10 times as great as the other

Essentially the measurement of a sample of a radioisotope is the measurement of the number of radioactive atoms present. This involves three basic matters: (1) the total number of radioactive atoms present; (2) the disintegration, or decay, constant, and (3) the disintegration rate, or "activity," the number of atoms disintegrating in unit time.

Atom Total

Measurement of the rate of disintegration, that is, the number of atoms disintegrating in unit time, is necessary in order to determine the total number of atoms present. The disintegration rate is, of course, equal to the number of nuclear particles, usually beta particles or positrons, which are emitted per unit time from all atoms which disintegrate within this interval. This is true since, in general, one of these particles is emitted for each disintegration which takes place.

Most of the difficulties in making quantitative determinations of radioisotopes can be eliminated if standard sources of the radioisotope under measurement are available. A standard source consists of a preparation of the isotope in a form convenient for use with the detector of radiation, and for which the disintegration rate is known from previous calibration.

Half-Life

Obviously, to be useful as a standard, a radioisotope must have a relatively long half-life. Furthermore, of those which have a sufficiently long half-life, only those which can be calibrated in absolute disintegration rates, are acceptable for preparation of standards. The number of isotopes which satisfy both these requirements is at present very limited.

When the standard is prepared from the *same* isotope as that to be measured only three simple precautions are required to secure reliable results: (1) Readings must be made with the standard in the same position as that at which readings are made on the sample; (2) the sample must be uniformly distributed over approximately the

same geometrical area as the standard; and (3) the sample must be supported on a layer of material identical with that supporting the standard, or at least one that produces the same back-scattering effect.

Beta-ray Standards

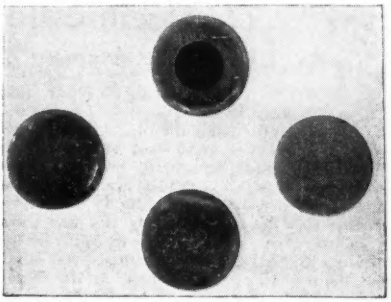
Since calibrated standards supplied by the bureau can be expected to maintain their calibration only when handled carefully by trained personnel, it is desirable that laboratories should prepare their own working standards. This applies particularly to beta-ray standards deposited on metal planchats, such as the RaD + E standards. There is another advantage in the preparation of working standards in the laboratory. This permits the primary standards in many instances to be prepared as gamma-ray standards consisting of a solution sealed in a glass ampoule from which it need never be removed.

An example is furnished by the Co^{60} standards now available from the bureau. They consist of 5 ml. of solution containing a total of 1.5 rd (rutherfords; 1.5×10^6 disintegrations per second) in one series, and 0.15 rd in another. They may be used to calibrate unknown solutions of Co^{60} by comparing the gamma-ray activity of the unknown solution in a similar ampoule, using a gamma-ray electroscope for the purpose. The ratio of these readings, corrected for background, provides the information for computing the strength of the unknown solution in terms of a disintegration rate. After the unknown sample has been calibrated, it can be made up to a standard volume, diluted in known ratios, and aliquots taken to produce deposits of appropriate activity for beta-ray standards.

Disintegration Rates

It has been shown that, without a knowledge of the disintegration scheme, it is impossible to make reliable measurements of radioisotopes in terms of disintegration rates. The disintegration scheme serves to determine whether the mode of disintegration is such that disintegration rates can be obtained from observations which can be made conveniently. For example, if the isotope is a positron emitter but also disintegrates in part by electron capture, there is no convenient way of measuring the disintegration rate since it is difficult to determine the number of disintegrations occurring by electron capture. This capture can be detected only by the resulting characteristic x-radiation.

In the case of those isotopes for which disintegration schemes are lacking or for which it is known that the mode of disintegration does not lend itself to measurement of disintegration rates, an alternative method of comparison of activities of sources is available if the isotope emits gamma-rays. This alternative does not give disintegration rates but it can, when properly applied, yield reliable comparisons of sources in various laboratories.



A standard radioactive sample (circular silver disc with dark centre) with which are compared unknown deposits mounted on the blank discs

Gamma Radiation

For a particular isotope which emits gamma-rays it is obvious that the intensity of the gamma radiation emitted is proportional to the amount of the isotope present. However, it is a well known fact that electroscopes and ionisation chambers used for measuring gamma-rays have sensitivities which vary greatly due to variations in size, materials, geometrical disposition of the source, and similar factors. Therefore, the comparison of source strengths by the gamma-ray method is a valid method only when confined to the same isotope and when using the same electroscope in the same geometrical relation to the source. This is the basic principle of all measurements of radium by the gamma-ray method.

A method has been proposed for extension of the gamma-ray method of comparison of sources to all laboratories. To obtain uniform results with such a method, no matter where the comparisons are made, a standard instrument and standard geometry are necessary. A requirement for the standard instrument is that it shall yield the same response for two equal samples of any isotope, regardless of the energies of the gamma-rays emitted by these isotopes. There is a unit of gamma radiation which is defined without reference to the energy of the gamma-ray. This is the roentgen ("That quantity of roentgen or gamma radiation such that the associated corpuscu-

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Chemical Rust Remover

German Development of a Non-Destructive Process

REPORTS from Germany earlier this year that a German process for removing rust by chemical means had been evolved aroused a good deal of interest in shipbuilding and engineering circles in this country, although no details were available of the actual process or methods used. The process was developed during the war by a Hamburg firm associated with the shipbuilding industry, and has since been used to remove rust from ships' hulls, steel vaults and bridges in the western zone of Germany.

It is claimed that the chemical used mixes with rust without eating into the surface of the metal, and in this way the rust is completely removed and the surface is protected from further deterioration. The loss of substance associated with mechanical de-rusting methods is avoided and it is stated that it is possible to clean by this process precision instruments, bearings and machine shafts without upsetting the calibration.

The actual chemical used has not been put under patent, but it is believed to be safe from duplication. An agreement has already been concluded for the process to be used in France under licence.

There are three separate methods used in this de-rusting process: dipping the articles, the application of a paste, and a method for larger surfaces which converts rust into a protective covering.

With the first method tools or machinery are simply immersed in a chemical bath; after a few hours, depending on the degree of de-rusting that is needed, the rust is completely removed without the surface of the metal being affected. the iron parts are then rinsed, chemically neutralised and given a further chemical treatment to make them impervious to rusting again. Paint, oil and grease are able to adhere to the surface thus imparted to the metal.

For the treatment of larger surfaces, a chemical paste is applied by a special method, and after this the process and results are the same as those described above for dipping. This process was used to clean a 5000-ton motorship, and in that instance the paste was washed off with a pressure hose after which the whole surface was coated with rust-resistant paint and was ready for normal protective painting.

According to the firm in Hamburg, the dipping method was used to clean machine tools which had become rusty through exposure after an air-raid on the Deutsche Werft shipyard in 1943, and although the cleaning was only recently undertaken the tools are now in use again. The paste method has been used on ships and steel bank vaults, the latter being so constructed and situated that no mechanical or sand-blasting method of cleaning would have been possible.

MEASUREMENT OF RADIOISOTOPES

(*Continued from previous page*)

lar emission (secondary beta radiation) per 0.001293 gm. of air, produces, in air, ions carrying one electrostatic unit of electricity of either sign." Therefore, an ionisation instrument properly designed to measure roentgens will satisfy the requirement of a standard instrument. To determine the strength of a radioactive source the roentgens per unit time must be measured at a standard distance.

As originally defined and amended in 1930, the curie refers to the rate of disintegration of 1 gm. of radium since 1 curie of radon, by virtue of its definition as the quantity in equilibrium with 1 gm. of radium, is also that amount of radon (or any other member of the radium family), which has a rate of disintegration equal to 1 gm. or radium. Consequently, the curie can be applied only when it is intended to refer to rate of disintegration.

For many purposes a unit for the disintegration rate can be used which is smaller than the curie and which can be specified exactly and independently of any natural constants, such as the rate of decay of radium. A convenient quantity for a unit is that quantity of radioisotope which disintegrates at the rate of a million disintegrations per second. Features which make the unit " rd." simple to use include a numerical magnitude that is easy to remember, and a size that is frequently used in the laboratory. For example, a therapeutic dose of many isotopes will be of the order of 100 rd., beta-ray sources for use with mica-window bell-type counters will be of the order of 100 to 500 rd., and the weakest source that can be measured with any accuracy with these counters is of the order of 1 rd. Tracer samples will usually be of the order of 1 rd.

The use of the rutherford in data presupposes that a disintegration rate has been measured and that this rate is expressed in terms of disintegrations per second. This procedure, if rigidly followed, removes all confusion regarding units and renders data reported from different laboratories directly comparable on an absolute basis.

PRECISE PRESSURE MEASUREMENT—II

French Progress in Weight and Piston Manometers

IN his review of some highly sensitive appliances now in use for pressure measurement given before the Centre de Perfectionnement Technique, Paris,* Louis Le Blan dealt first with three further types of manometers: (a) reduced pressure, (b) weight manometer, and (c) manometric balance.

They have about the same degree of precision, but the first is probably much less convenient than the other two, partly at least in reading a high column of mercury and in replacement to zero position. Yet this apparatus gives excellent results and one has been designed and made in the Laboratoire d'Essais of the CNAM (Conservatoire Nat. des Arts et Metiers) for measuring pressures in the neighbourhood of 150 kg./cm². It has been used, too, in connection with petroleum drilling, with range of error less than 10^{-4}.

The other two (b) and (c) are closely related, but there are certain points of difference which are discussed (*Chim. et Ind.*, *61*, 350) in connection with Fig. 1, the balance being less sensitive than the weight manometer in its manipulation. It may be used in cases where a precision of 10^{-5} is sufficient, and is to be preferred for pressures in excess of 1000 kg./cm².

* The full account of this paper was presented in *Chimie & Industrie* (1949, *61*, 235-239 and subsequent issues) from which this summary and diagrams were derived. The previous reference to this subject appeared in THE CHEMICAL AGE, *60*, 796-7.

The first manometric balance was made in France by Bourdon, inventor of the metallic manometers. The Lab. d'Essais CNAM has recently designed a weight manometer of modified type with which, with direct loading, pressures of 2·5 kg./cm² may be measured, and, with an auxiliary device, pressures up to 500 kg./cm².

Wide Test Range

The author reports results of tests made with this modified form of weight manometer, as shown in Fig. 1, designed for pressures of 2 to 200 kg/cm². The results were in two groups: (1) standardising with columns of Hg of 1·3m., and (2) sensibility tests for pressures up to 150 kg.

In the first the ratio of Hg column to loaded piston of known mass was determined for four values of mass, and average for m was 2.71552. Deviations with the mean $\frac{a-m}{m}$ $\frac{b-m}{m}$ etc., were respectively: 0.7×10^{-4}, 2.1×10^{-4}, 1.8×10^{-4}, and -10^{-4}.

In the second series of tests at 150 kg./cm² various precautions were taken to ensure a fairly constant pressure, using a cylinder of compressed air (150 kg.) immersed in a vessel containing 100 lit. water and placed in a room of constant temperature 0.1°. Measurements were made at the end of 24 hours, the piston load being adjusted to be

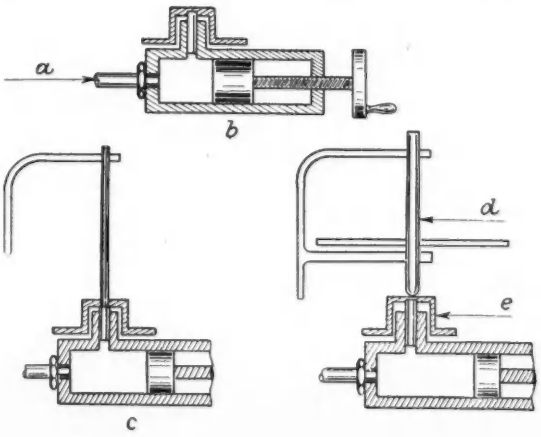


Fig. 1

a. Pressure control

b. Direct load with overhang

c. Direct load without overhang

d. High pressure plate

e. Low pressure plate

in equilibrium with the pressure, though absolute equilibrium was not quite possible.

A new type of recording piston manometer has lately been introduced and used by the Lab. d'Essais, for use in connection with natural gas well pressures, with an accuracy within 10^{-4}, and a pressure range og 120-200 kg./cm². It is a combination of the weight manometer and the manometric balance, and its general arrangement is shown in Fig. 2.

For a recording apparatus equilibrium of the balance must be automatic. This is attained by means of a frame movable in an alternating magnetic field (50 cycle) and attached to a balance arm in such manner that it is not connected with the field when the arm is horizontal. When the arm is out of the equilibrium position it enters the magnetic field and a potential is induced proportional to the angle of arm with the horizontal. This potential, after being amplified, is applied to a phase discriminator delivering a continuous current of which the density is proportional to the amplified voltage, while its direction depends on the voltage phase.

The current is sufficient to actuate a small motor on the arm, with an endless screw governing the position of the movable weight of balance. This electro-mechanical device may be called variable speed float control. The contra e.m.f. is slight and the speed of the motor is thus practically proportional to the excitation current, *i.e.*, to angle of arm with horizontal.

Accuracy was tested under a known constant pressure, and was found to be within 10^{-4}, and is probably even closer.

In practice it has been found desirable, in order to ensure uniform functioning of the control, to fractionate or interrupt its working; *e.g.*, after working for some tenths of a second it is switched out of action for a few seconds. A device of this kind has been patented and developed by Etab. Beaudouin, of Paris.

Le Blan concludes his paper with a description of the Loch Scam Selsyn system used on the French naval vessels. It is essentially a manometer with a precision intermediate between metal manometers and the piston type.

The opening of a Pitot tube is directed forward and at a sufficient depth below the water-line to ensure calm water. Difference of pressure between that in the Pitot tube and static is expressed in the formula: $P = KV^2$ ..... (1), where coefficient K is theoretically constant, but varies slightly due to slight currents under the hull. Pressure to be measured acts on a membrane and thence on a lever of which the other end actuates a controllable tension spring. Tension is governed by a servo-motor so that the membrane is in equilibrium and the lever occupies a definite position.

Any disequilibrium turns the lever about an angle which in turn acts on the servo-motor through a reverser attached to the lever and a cam of such profile that its angle of rotation is a linear function of the square root of the pressure measured, and thus also of the speed (formula 1).

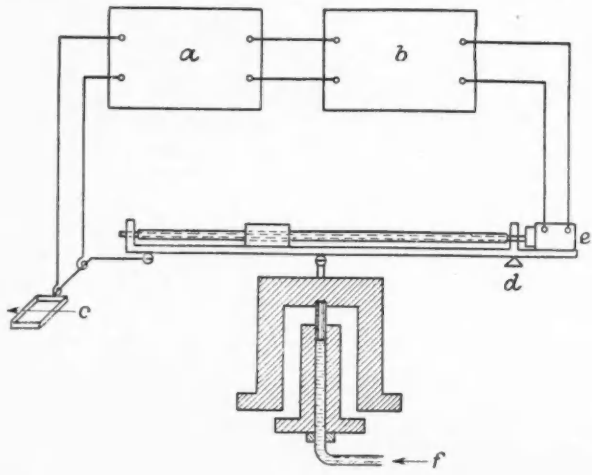


Fig. 2

- **a. Amplifier**
- **b. Phase discriminator**
- **c. Moveable frame in a (fixed) alternating magnetic field**
- **d. Ball-bearing shaft mounting**
- **e. Servo motor**
- **f. Source of pressure**

TESTS OF INSECTICIDAL GASES

Pest Control Laboratory's Search for Safe Materials

SOME new light on the development of fumigation technique, and some other procedures is provided by the summary of the work which has been carried on since 1940 by the Pest Infestation Laboratory of the Department of Scientific and Industrial Research.

This description of the widely based investigations into means of destroying insects of several common kinds infesting grain and similar bulk stores forms the bulk of the current report (for 1947) of the Pest Infestation Research Board (DSIR) (THE CHEMICAL AGE, "Notes and Comments," *60*, 847).

In studying the treatment of stored products by fumigants the type of information required concerned, chiefly, the safety aspects, such as the amount and composition of fumigant residues in the treated foodstuff, the possibility of such residues rendering the foodstuff toxic to man or animals, or adversely affecting its quality, and the possible danger to operatives resulting from gas concentrations in the working spaces, during and following the process of fumigation.

The laboratory's first task, says the current report, was to provide as rapidly as possible, data for the assessment of the "safety" of grain fumigation, at the same time carrying out work, in the laboratory and on the full scale in silo bins, to study the penetration of fumigants through grain in bulk.

No Dangerous Residues

It was decided to use, first, ethylene oxide as the fumigant. This gas was chosen because it had already been used for the treatment of grain in the U.S.A. and elsewhere, and it was less likely to leave dangerous residues in the foodstuff than, say, hydrogen cyanide, which had also been used for the same purpose. Furthermore, the laboratory had considerable knowledge of the use of this gas for the treatment of other materials (*e.g.*, dried fruit).

Analytical work was carried out in the laboratory to determine the extent and nature of the residues of the ethylene oxide to be expected in wheat, milling offal and flour, following fumigation.

At the same time collaborative experiments were undertaken, with the Research Association of British Flour Millers, and with the Ministry of Agriculture, to determine the effect of fumigation with ethylene oxide on the milling and baking properties of wheat and flour and to establish, by feeding tests on livestock, whether any harmful effect was to be expected as the result of the consumption by animals of fumigated cereals. All the tests showed that fumigation with ethylene oxide would not damage the foodstuff physically or render it harmful if consumed.

The next step was to conduct full-scale experiments in silo bins to determine the most successful method of applying the fumigant, to study the penetration of the gas throughout the bulk of grain, and to measure the concentrations of fumigant occurring in the working spaces at the top of the silo during the application of the fumigant and subsequently. Special equipment had to be devised and made for measuring gas concentrations within the bulk of wheat.

Carbon Dioxide Mixture

Working on the principle of drawing the fumigant air samples into evacuated flasks, suitable lengths of fine-bore lead capillary tubing were fixed to steel wire and suspended in the silo bin. The fumigant, ethylene oxide, was mixed with solid carbon dioxide to form a slush, and spoonfuls of this slush were added at calculated intervals to the stream of grain as it fell into the empty bin.

Certain drawbacks made this method inconvenient in practice, and attention was accordingly turned to the possibility of using hydrogen cyanide. A technique had been worked out in the U.S.A. for applying this fumigant in a finely divided solid form, as calcium cyanide, to the grain stream by means of special "applicators," or drums fitted with interchangeable orifices giving a controllable flow of solid fumigant. Clearly, the use of a gas as poisonous as hydrogen cyanide introduces greater potential hazards than would be expected with ethylene oxide, and in the absence, again, of the necessary critical data, it was more than ever important to carry out preliminary check experiments as described above for ethylene oxide.

Feeding tests with livestock showed a reassuring safety margin between the minimum toxic dose and the greatest concentration that was likely to be attained in practice. It was found that the baking quality of flour made from wheat that had been fumigated with hydrogen cyanide was appreciably affected, but the effect was reduced to negligible proportions if the usual "improving" treatment was given to the fumigated flour.

As with ethylene oxide, so too with cyan-

ide, extensive full scale experiments were undertaken before the method could be recommended to the Ministry of Food, and further tests have been made since the method was adopted as a regular means of disinfestation.

The fumigation in silos of wheat and other grain with hydrogen cyanide applied as calcium cyanide has been found in practice to give a valuable measure of control, and very large tonnages have been treated in this way in Great Britain. One disadvantage of the method is the necessity of introducing the fumigant into the grain as it enters an empty silo bin. It would be a great advantage if it were possible to treat silo bins already full of grain.

This has been done, notably in Germany, by means of gas-circulating plant attached to the silo, by means of which fumigants may be blown through a bulk of grain and circulated until an even concentration is obtained. No such plants exist in this country, though some interest in them was being expressed shortly before the war and is now being revived.

Explosive Mixture

The most extensive investigations on the small scale were carried out on bagged flour; the effect of treatment with hydrogen cyanide, ethylene oxide, ethylene dichloride and, at a later date, methyl bromide, on the baking quality being investigated in collaboration with the Research Association of British Flour Millers.

The fumigant most extensively used for the treatment of many foodstuffs was ethylene oxide. This gas is explosively inflammable in a wide range of concentrations in air, and as originally employed in this country explosive mixtures were normally produced during fumigations.

As a result of small and large-scale trials carried out by the laboratory, a system was developed in which the fumigant was applied in conjunction with high concentrations of carbon dioxide which was evolved from the solid form.

The resistance of insects to ethylene oxide was thereby reduced, thus allowing a substantial reduction to be effected in the dose of fumigant. As a result the inflammability hazard was considerably diminished and an important saving in fumigant effected. This system has found very wide application for the treatment of different products in barges, chambers and warehouses.

The carbon dioxide is normally introduced as the crushed solid into the space to be fumigated, but more effective distribution can be obtained by vaporising a mixture of the ethylene oxide and crushed solid carbon dioxide from a simple form of vaporiser.

This apparatus has been patented and a number of the vaporisers have been fitted in industrial fumigating plants.

All fumigants mentioned so far had one characteristic in common, namely, that they were all taken up, or sorbed, in a considerable, though varying, degree by the product being treated.

From the practical point of view, high sorption is a serious disadvantage, not so much from the danger of heavy permanent residues, for desorption may eventually be practically complete, but rather because it results in relatively slow penetrations in packages and bulks and correspondingly slow removal of fumigant during the airing period.

A suitable fumigant was found in methyl bromide. This gas had been exploited in the U.S.A. where it had been found useful for fumigation of many types of material.

Comparative studies of the sorption of methyl bromide and other fumigants in the laboratory, demonstrated conclusively the superiority of methyl bromide. Intensive work was accordingly undertaken on this new fumigant, and is still continuing.

The first step was to select or devise analytical methods suitable for the determination of concentrations of methyl bromide in samples of air collected in evacuated flasks.

Methods for determination of residual bromide were also examined and systematic studies made of the sorption of methyl bromide by wheat, flour, groundnuts and other products.

Mode of Action

It was found that, in so far as there is action by the methyl bromide on the products, it is restricted almost exclusively to the protein fraction, and the detailed investigation of these reactions, which has been extended to include the effect on certain enzyme systems, is not only providing information on the nature of the products which remain in foodstuffs after fumigation but gives a clue to the mode of toxic action of methyl bromide.

The serious toxic character of methyl bromide undoubtedly militated against its immediate adoption in this country as a fumigant, and one of the main objects in the investigation of this fumigant has been the provision of data which would allow a proper assessment of the toxic hazards which might be expected in practice.

The object of fumigation is, of course, to kill insects, and it is necessary to have data regarding the resistance of the different insects to fumigants, which differ with the different stages—egg, larva, pupa and adult—and even in corresponding stages of different species according to the temperature at which the treatment is carried out.

New Source of Hydrogen Cyanide

Profitable U.S. Conversion of Natural Gas

HELPING to satisfy the continually expanding demand for hydrocyanic acid, Rohm and Haas Company has tapped an inexhaustible fresh source of raw materials—natural gas and ammonia. In a recently erected plant at Deer Park, Texas, full-scale synthesis of hydrogen cyanide from methane is being carried out for the first time.

To-day's demand for hydrocyanic acid is still largely satisfied by the more traditional methods. Of particular commercial importance is the action of dilute sulphuric acid on naturally occurring cyanide and thiocyanic salts. Another process which has been practised commercially involves the action of nitric acid on alkali thiocyanates. Formamide, produced by the reaction between ammonia and formic acid, can be dehydrated catalytically to yield hydrocyanic acid—an approach which has been adopted commercially in Germany.

Other important sources of hydrocyanic acid are coke-oven gas from which slightly less than 1 lb. of HCN can be recovered per ton of coal carbonised.

A fairly large supply of hydrocyanic acid is available in Central European countries which operate the Schlempe process for the high-temperature recovery of hydrogen cyanide from the spent juice of the sugar beat.

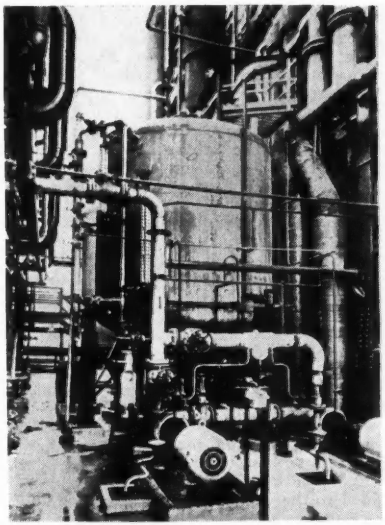
Commercially attractive methods for the synthesis of hydrogen cyanide include the reaction between carbon monoxide and ammonia. The reaction is carried out above 550°C. in the presence of a platinum catalyst and with a high carbon monoxide excess (up to 800 per cent). Hydrogen cyanide can be synthesised in this fashion in yields up to 55 per cent.

Engineering Difficulties

The reaction between methane and ammonia has attracted interest for many years. It was found to be highly endothermic and had to be carried out at temperatures above 1400°C. before fair hydrocyanic acid yields could be obtained. The commercial exploitation of this reaction was thus defeated by the engineering difficulties in providing suitable materials of construction and in supplying the necessary heat of reaction.

In 1930, L. Andrussow discovered that mixtures of ammonia and methane could be oxidised catalytically in good yields. The oxidative reaction was highly exothermic. The reaction could be initiated at 800°C. or even less. The progress of the reaction resulted in an increase in gas temperature up to 1200-1300°C. This is the reaction which has achieved commercial realisation at Deer Park:—

$$2\ CH_4 + 3\ O_2 + 2\ NH_3 = 2\ HCN + 6\ H_2O \quad (+229.8\ \text{kcal}).$$



Part of the ancillary equipment leading to the converter cells in the Deer Park hydrocyanic acid plant

The best raw gas for the reaction has been found to contain approximately equivalent quantities of methane and ammonia and somewhat less than the theoretical amount of air. A typical reaction mixture contains 11 per cent ammonia, 12 per cent methane, the remainder being air. Andrussow reports that at 1000°C., 58-63 per cent of the ammonia could be converted to hydrocyanic acid, while 26-30 per cent remained unconverted and 8-12 was oxidised to element nitrogen.

The reaction resembles the catalytic oxidation of ammonia both in mechanism and in technical procedure. The preferred catalyst is platinum and platinum-rhodium gauze. Other catalysts which have been employed for ammonia oxidation have also proved successful for the production of hydrocyanic acid. Most important among these are bismuth oxide-promoted iron oxide, cerium oxide on silica gel, etc.

The postulated reaction mechanism in-

volves the intermediate formation of nitroxyl :—

(1) $NH_3 + O_2 = NH_3.O_2 = HNO + H_2O$

(2) $HNO + CH_4 = HNO.H_2CH_2$
$= HN.CH_2 + H_2O$

(3) $HNCH_2 = HCN + H_2$.

The main by-products of the reaction are nitrogen, water, hydrogen and carbon monoxide (due to the direct oxidation of methane). One very important feature is the occurrence of carbon dioxide in only very small amounts. This marks a distinct advantage over the synthesis of hydrocyanic acid from carbon monoxide and ammonia, in which the separation of carbon dioxide from the desired product represents a point of major difficulty.

The plant at Deer Park uses a highly purified grade of methane, derived from natural gas. The raw streams—methane, ammonia, and air—are individually preheated to reaction temperature. In the preheated stage, special provision is made to exploit the refrigerating action of the ammonia while it is being vaporised.

After passage through the catalytic converter, the gases are immediately scrubbed for the removal of ammonia. The hydrogen-cyanide-rich top gases are freed of HCN in a second scrubbing tower and are flared. Hydrocyanic acid is stripped from the scrubbing liquor by distillation. An inhibitor is added to the condensed hydrogen cyanide in order to prevent spontaneous polymerisation and breakdown reaction. The product is then ready for storage or use.

The Deer Park plant prefers to convert the hydrocyanic acid to acetone cyanhydrin or to ethylene cyanhydrin prior to shipment. In both cases, the reaction is carried out in the presence of an alkaline catalyst.

The product of acetone and hydrocyanic acid may be used as a chemical intermediate. Its main importance rests, however, in the fact that it can be decomposed almost quantitatively at elevated temperatures for the regeneration of its components. Acetone cyanhydrin therefore represents an efficient and comparatively safe method to ship hydrocyanic acid.

Ethylene cyanhydrin, formed by the action of ethylene oxide on hydrocyanic acid, is an important intermediate in the manufacture of acrylonitrile, a compound of ever-growing significance in the production of plastics of the Plexiglas type, synthetic rubbers, and some synthetic fibres.

Corrosion problems in the synthetic hydrocyanic acid plant at Deer Park are severe. Several types of stainless steel and even lead are used throughout the plant. Engineering problems are particularly great in the high-temperature section of the plant. Their satisfactory solution has opened a new and important outlet for America's abundant natural gas.

IMPROVED TUBE-DRAWING

A NEW type of tube-drawing machine, which may prove of considerable value in chemical plant construction, was demonstrated in Birmingham last week.

The machine, introduced by the Head Wrightson Machine Co., Ltd., Middlesbrough, is described as the first fully automatic, push-pointing, triple-draw tube-drawing bench. The principal feature is its push-pointer, which obviates the need for a separate forging machine to forge the end of the tube to a smaller size to go through the die.

The results achieved were described by Mr. J. G. Wrightson, director of the company, as an example of Anglo-American collaboration friendship. The bench, dies and charging mechanism were developed by the company's American associates.

The new machine can handle three tubes at a time, and is operated by two men. With a maximum pull of 25,000 lb., it has a possible draw length of 25 ft., up to 200 ft. a minute, and draws tubes up to a maximum of 2½ in. diameter. Cross-sectional area can be reduced by from 10 to 45 per cent.

USE OF IRON ORE FINES

A NEW method of utilising extremely fine sizes of iron ore in blast furnace operations by employing a variation of the "Disco" smokeless fuel process has been the object of exploratory tests by the Pittsburg Consolidation Coal Co., in collaboration with the National Steel Corporation and the M. A. Hanna Co.

The new development involves procedure in two stages. First, fine sizes of iron ore and metallurgical coal are mixed and passed through the special process, which agglomerates the mixture into ball-shaped lumps for use in the blast furnace burden. In the second stage the agglomerate is used in a blast furnace.

Experiments in methods of agglomerating iron ore fines have been stimulated by the steel industry's growing dependence on lower-grade ore deposits, which require exceptionally fine crushing.

The new technique has been investigated for several years by the Disco Co., a subsidiary of Pittsburg Consolidation Coal Corporation, by which patents for the process are held.

SOURCES OF ORGANIC SOLVENTS

Extraction from Refinery and Natural Gases

THE interesting suggestion that there is a good supply of natural gas in this country, which might serve as a source of solvents, was made by a member at a recent meeting of the London and South Eastern Counties Section of the Royal Institute of Chemistry. This theory was put forward in the discussion which followed the reading, by Dr. J. L. Edgar, of a fundamental survey of "Modern Methods of Organic Solvent Manufacture," at a recent meeting of the section. The member stated that the I.C.I. was, in fact, prospecting on these lines.

Dr. Edgar said, whereas large quantities of solvents continued to be made by fermentation processes from natural sources and from coal tar, the most modern methods of manufacture consisted of the direct synthesis of the solvents from hydrocarbons. There were found in the U.S.A. large quantities of natural gas which consisted mainly of the saturated hydrocarbons. Those might be converted into a wide range of solvents by direct oxidation under carefully controlled conditions.

Abundant Olefins

However, by far the more important source of hydrocarbons was the waste gas arising from petroleum refineries. All refineries wherein cracking operations were carried out produced large quantities of cracked gas which contained high percentages of olefins. The gas might be separated into its constituents quite easily by fractional distillation or by a combination of distillation, absorption, and sometimes adsorption processes.

The olefins were converted into the corresponding alcohols by allowing them to react with sulphuric acid, hydrolysing the resulting esters, and stripping the alcohols from the acid with steam. In the case of ethylene, ethyl alcohol might be produced by the direct hydration of the olefin over a suitable catalyst. The alcohols were purified by distillation processes.

Since the hydroxyl group adds to that carbon atom to which was attached the least number of hydrogen atoms, only secondary or tertiary alcohols might be produced. Propylene yielded iso-propyl alcohol, *n*-butylene yielded secondary butyl alcohol, and iso-butylene yielded tertiary butyl alcohol.

The corresponding ketones were manufactured by the catalytic dehydrogenation of the alcohols. From isopropyl alcohol acetone was produced. This might be condensed by means of a suitable catalyst to yield diacetone alcohol, which in its turn might be dehydrated for the production of mesityl oxide. This could then be hydrogenated to yield methyl iso-butyl ketone and methyl iso-butyl carbinol.

Propylene might also be chlorinated at high temperature and at low pressure to yield allyl chloride, which on hydrolysis gave allyl alcohol. Allyl chloride could be further chlorinated to give trichlorpropane or it could be hydrochlorinated to give glycerol dichlorhydrine. Either of those products on hydrolysis with caustic soda resulted in the production of glycerine. A plant for the production of synthetic glycerine had recently been brought on stream by the Shell Chemical Corporation (U.S.A.).

Toluene from Petroleum

In the field of aromatic solvents, cyclohexane and methyl cyclohexane could be isolated from petroleum by the process of super-fractionation. On dehydrogenation, the former yielded benzene and the latter toluene. This process was responsible for the production of large quantities of toluene during the war.

Only a few years ago the refinery gases were burnt as fuel, piped to nearby towns for domestic use, or even burnt at a flare. To-day they formed the basis of a new industry, which was now in its infancy but which was expanding rapidly and was supplying other industries with a wide range of new solvents in addition to supplementing the production of those in common use.

OXO Process Undeveloped

Among the points in the discussion, attention was called to the fact that the absorption process was really a process of chromatography. Another member asked what were the prospects of obtaining ethylene from coke-oven gases. The lecturer said that the hypersorption process should be very applicable to the separation. The OXO process also was considered.

Dr. Edgar said he had no knowledge of the availability of natural gas in this country; if it were to be used at all, a regular supply must be assured. The OXO process, he said, had not yet been fully developed commercially.

Asked for an economic comparison between the new processes and the fermentation processes so far as the British Empire was concerned, Dr. Edgar said he considered that the two processes must be considered not as competitive but as complementary.

A CHEMIST'S BOOKSHELF

Werkstoff Aluminium und Seine Anodische Oxydation. (Aluminium Material—Anodic Oxidation.) Dr. Max Schenk. 1948. Berne: A. Francke A.-G. Pp. 1042. S.Fr.138.

In the course of the last ten years the production of aluminium has made immense progress. Methods of production, of alloying, working processes and forms of surface treatment have been greatly advanced and Switzerland has taken a considerable part in these developments. Aluminium now occupies one of the first places in metals of current use.

Among the surface treatments of aluminium, and of its light alloys, electrolytic (anodic) oxidation (anodising) has gained the most importance. It is to aluminium, what phosphatisation is to iron, or galvanisation to all heavy metals. A large proportion of the most important patents concerning the anodic oxidation technique have already expired, or soon will do so. No complete treatise has so far existed of the technique of anodic oxidation and of the connected fields to spare the practitioner much painstaking research in books, patents and periodicals. This volume, by an acknowledged authority, is destined for the practitioner and intended to remedy this omission. Its first aim is to familiarise technicians with the most diverse lines with the nature and the properties of aluminium and its anodic oxidation. That necessarily calls for a description of the connected technological problems.

The completeness of the information which the book presents is reflected in the following chapter headings (number of pages in brackets): Part I deals with: The metallography of alloys (60); working processes (80); physical properties (10); heat treatments (4); chemical and electrochemical bearing (240); corrosion phenomena (50); constitution and structure of the surface (30). The subsequent chapters, in Part II, treat with the processes of treatment by chemical solutions (20); the formation of superficial layers by anodic oxidation (50); the properties of anodically produced oxide layers (100); technical processes of anodic oxidation (120); defect possibilities (30); constructive principles (30); examples of application (15); testing (80).

Each chapter incorporates a comprehensive list of references. There is also a summary of patents, and a bibliography with over 800 quotations. The volume contains two four-colour prints, 618 text-illustrations, 121 tables and a subject index, which help to give it the status of a standard work on its subject.

General and Applied Chemistry. Currier and Rose. 1949. London: McGraw-Hill. Pp. 275. 18s.

The authors of this book are professors of chemistry and chemical engineering respectively at the Pennsylvania State College and the present volume is an attempt to provide a one-year college course in chemistry, particularly for those students who are taking chemistry only as a minor subject. No previous knowledge of the subject is assumed, and the material is treated at an elementary level, being equivalent to a standard between that of matriculation and intermediate science examinations. Since the book is designed for readers studying applied sciences, there are many references to the application of chemicals in industry and examples are shown by excellent photographs. In addition there are many well-drawn diagrams and various exercises have been interspersed throughout each chapter rather than at the end, to enable the reader to appreciate the relation between the questions and the text. Owing, however, to the elementary nature of the problems and the fact that they are virtually part of the text it means that little thought is required from the student.

The first part of the book deals with simple chemical laws and the more important non-metals and it concludes with chapters on the more common metals which are arranged roughly in the order in which they are encountered in qualitative analysis. Two chapters in the middle deal with fuels and carbohydrates and may be considered as subsidiary to the carbon chapter, but it is doubtful whether a student at this stage in his career would be able to appreciate the graphical formulæ given, while to say that the properties of benzene are those of an unsaturated compound is very misleading. The appearance of the book is well up to the usual high standards of the publishers and its information is succinctly presented.

Technical News and Supplies

HIGH vacuum technique is the basis of many national research and industrial projects, and during the past year there has been considerable growth in the variety of its applications and in new products.

The heart of any high vacuum system must, of course, be the actual pump, so that any technical developments are of wide interest. In their series of Speedivac pumps, W. Edwards & Co. (London), Ltd., has incorporated a number of new features, which include reduction in weight and size, quiet running, improved pumping speed, oil baffle and draining arrangements.

In order to assist in classification and ordering, a new nomenclature for all Speedivac pumps has been adopted which conveys size and performance.

* * *

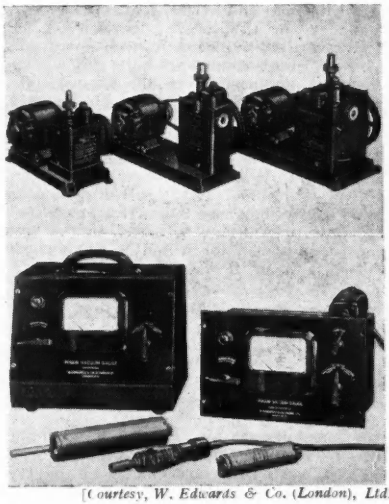
A new solvent extractor suitable for the extraction of fish meal, and of vegetable seeds which it had not previously been found possible economically to extract continuously, is the subject of the fifth bulletin issued by Bamag, Ltd., London. This (No 027), compiled by the company's research team of its oils and fats division, gives unusually full technical treatment and diagrams of the Bamag-Manning horizontal continuous solvent extractor and a Bamag continuous multi-stage solvent extraction plant for oil-bearing materials.

* * *

Pumps in chemical stoneware for acids and other corrosive liquids, stainless steel models and rubber-lined and lead-lined pumps, all having special applications in chemical industry, are among the number of designs of the Pneu-pump illustrated in the new booklet now available from Ames Crosta Mills & Co., Ltd., Heywood, Lancashire. This type of pump, in one or other of its forms, will cope with slurries, sludge, molten metal, viscous fluids, etc., at any temperature up to boiling point.

* * *

Flooring surface that gives a good grip and long wear plays an important part in the modern laboratory or factory. An interesting new application of aluminium alloy for treadplate has been produced by the British Aluminium Co., Ltd. This pattern gives a grip in any direction, contains no interstices to trap oil or water, and can be cleaned with a minimum of labour. An interesting feature of this treadplate is that it is non-sparking and so can be used for flooring in combustible atmospheres.



(Courtesy, W. Edwards & Co. (London), Ltd.

Improved rotary oil pumps of the Speedivac series for the production of high vacuum (top), and bench and panel models of the Pirani electrical vacuum gauge, showing three types of gauge head —two metal and one glass

From felt sheathing of a ship's bottom to roof decking for the largest existing nylon factory may seem a long cry, but these two examples serve to show how with expansion through the years D. Anderson & Son, Ltd., felt and paint manufacturers, Stretford, Manchester, has progressively adapted its technical applications to meet contemporary needs. In "The Story of 100 Years," the development of the company from its foundation in Belfast in 1849 is described.

* * *

Acrylic plastic is being increasingly used in a variety of applications from corrosion-resistant glazing in chemical plants to decorative architecture. This is the subject of an article "Plexiglas as a Building Material" in the *Rohm and Haas Reporter* (Vol. 7, No. 1). Other features include: new organic chemicals developed from the OXO synthesis, by Dr. E. H. Riddle; rothane insecticide for pest control; and an article showing how factory processes have been simulated on small-scale equipment at the Rohm and Haas research headquarters, Bridesburg, Philadelphia.

Personal

DR. J. P. BAXTER, a director of Imperial Chemical Industries, Ltd., and research manager of Widnes Laboratories, has accepted the invitation of the Government of New South Wales to take the chair of chemical engineering in the University of Technology at Sydney. The doctor with his wife and family will leave for Australia at the end of this year. He took an Honours degree in chemistry and Ph.D. degree in mechanical engineering at Birmingham University, joined I.C.I. at Billingham and came to Widnes in 1931. During the war he went to America to assist in the work on atomic power, for which he was awarded the O.B.E. in 1946.

MR. N. R. CRAWFORD, president of Dow Chemical of Canada, Ltd., has announced the addition of three new members to the board of directors and two changes in its officers. This fills the board vacancy created by the death of Dr. W. H. Dow and expands membership of the board from six to eight. New members are MR. CALVIN A CAMPBELL, MR. DONALD WILLIAMS and MR. RALPH M. HUNTER. All three are officers of the Dow Chemcal Co., of which Dow Chemical of Canada is a subsidiary. Concurrently, Mr. Williams was elected a vice-president of the Canadian company and Mr. Campbell was elected secretary to replace MR LELAND L. DOAN, now president of the parent company.

The following officers and executive committee have been elected to serve the Industrial Pest Control Association in 1949-50 :—

President, Dr. E. P. Coyne ; vice-president, Mr. R. P. Merritt ; hon. treasurer, Mr. C. Stuart Kregor ; hon. auditors, Mr. T. A. Action and Mr. C. L. Claremont. Executive committee : Messrs. R. G. Berchem, S. W. Hedgcock, Duncan R. Leitch, S. F. Sprange, J. B. Wilton, G. McLaren. Secretary, Mr. W. A. Williams.

On Saturday next (June 25) MR. JOHN BENN, whose introduction to business life was made as a representative of THE CHEMICAL AGE, becomes chairman of the United Kingdom Provident Institution, one of the leading insurance undertakings in the United Kingdom, from the chairmanship of which SIR ERNEST BENN then retires—on his 74th birthday. Mr. John Benn's interest in chemical industry and chemistry, awakened during studies at Princeton University, gained force during his period of years as a publisher of many technical and scientific works, in his capacity of chairman of Ernest Benn, Ltd., with which he will continue his active interest as a director. Principal control of the book publishing organisation will now be exercised by MR. GLANVILL BENN, a former managing director of Ernest Benn, Ltd., who is also chairman of Benn Brothers, Ltd. (proprietors of THE CHEMICAL AGE).

The filling of a number of important staff and administrative posts in connection with its interests in the plastics and gas industries has been announced by Thomas De La Rue & Co., Ltd. Technical appointments include the selection of Mr. W. F. CAMPLING to assume control of all factories of the plastics division and the Potterton gas division. MR. E. A. DAVIS, at present technical manager of the plastics division, will be appointed manager on July 1 of the technical sales development department. He will also continue to supervise the research and development department in Tynemouth. MR. H. KELLY has been appointed technical manager of the plastics division. MR. F. S. INGLIS becomes works manager of the Tynemouth factory; MR. S. DOW, assistant works manager of De La Rue Extrusions, Ltd., and De La Rue Floors and Furnishings, Ltd., and MR. G. HILL, works manager of the fabrication unit at Cricklewood (formerly, Hill, Norman and Beard Plastics, Ltd.). MR. E. G. BROOKS, general technical manager, will control factories of the Potterton gas division at Wandsworth, Warwick, and Gateshead.

NEXT WEEK'S EVENTS

MONDAY, JUNE 20

Electrodepositors' Technical Society. London: Northampton Polytechnic, St. John Street, E.C.1, 5.30 p.m. V. Evans: "Tank Linings and Insulating Materials."

Lille, International Commercial Fair. (Until July 3.)

THURSDAY, JUNE 23

Mineralogical Society. London: Burlington House, Piccadilly, W.1, 5 p.m. Exhibits structure models of some silicates and other minerals by Dr. Nora Wooster. Papers by Dr. S. R. Nockolds; E. W. Taylor; Dr. K. W. Andrews; Dr. M. H. Hey; and Dr. L. J. Spencer.

Obituary

The death was reported last Tuesday of PROF. EDMUND JOHNSTON GARWOOD, Emeritus Professor of Geology and Mineralogy at London University since 1931. The professor, who was 85, was a noted explorer and mountaineer.

The Birthday Honours List

O.M. for Sir Robert Robinson

Sir Robert Robinson

THE King's 26th list of Honours was announced last week on the occasion of the official celebration of His Majesty's birthday. The conferment of the Order of Merit on Sir Robert Robinson, president of the Royal Society, pays recognition on a national basis to the distinguished research in organic chemistry which gained for him the recent Nobel award.

For their services (in association with the late Dr. F. Curd) in the discovery of Paludrine and Antrycide, Dr. D. G. Davey and Dr. F. L. Rose were awarded the O.B.E.

Among the recipients of the B.E.M. was Edwin Greenslade, of Pontycymmer, Glamorganshire, employed at the International Colliery, Blaengarw, who last year cut and loaded more than 1000 tons of coal in a 10-week period. He achieved this record while working in a seam 4 ft. 6 in. thick, under average working conditions.

The new knights represented a wide variety of interests and included the following: Prof. David Brunt, Professor of Meteorology, Imperial College of Science and Technology; Dr. R. G. Hatton, director, East Malling Research Station; John Ernest James, chairman, Lancashire Steel Corporation, Ltd.; Kenneth Raydon Swan, chairman of the committee to consider the Patents and Designs Act; and Prof. J. A. Scott Watson, chief scientific and agricultural adviser, Ministry of Agriculture and Fisheries.

C.M.G.s were awardwed to C. H. Hampshire, secretary, the British Pharmacopoeia Commission, and F. Dixey, geological adviser to the Secretary of State for Colonies, and director of Colonial Geological Survey.

Among the C.B.E.s were G. H. Cunningham (New Zealand) for services in plant research and plant diseases; G. H. A. Field, director of research, Aluminium Laboratories, Ltd.; F. H. K. Green, assistant secretary, Medical Research Council; W. A. Mackintosh, director of research, Discovery Committee; J. R. Nicholls, deputy Government Chemist; and R. M. Shone, secretary, British Iron and Steel Federation.

O.B.E. awards included: H. F. Bannister, assistant director of engineering services (atomic energy), Ministry of Supply; F. J. North, for services to scientific education in Wales; G. E. Reay, superintendent, Torry Research Station, DSIR; H. W. Secker, technical adviser on scrap materials to the Iron and Steel Division, Ministry of Supply; and F. Walker, chief engineer Fort Dunlop, and chairman of the Midland Regional Fuel Efficiency Committee, Birmingham.

Among those awarded the M.B.E. was Henry Douglas Lang, who joined Brunner Mond & Co., Winnington, as a boilermaker and has become an engineering manager with I.C.I., Ltd., completing 46 years with the firm.

Recipients of the B.E.M. included Cliver A. Harris, chief of the commissionaires at Fort Dunlop.

ETS LINKS WITH HOLLAND

AT the invitation of the Dutch Society Bond Voor Materialenkennis, Dr. S. Wernick, honorary secretary of the Electrodepositors' Technical Society, recently visited Utrecht, and delivered a lecture to the Metals Section. He dealt with some recent researches in the plating of zinc base die-castings, and initiated an interesting discussion.

Dr. Wernick recalled the great interest taken by Dutch technologists in the proceedings and activities of the Electrodepositors' Technical Society. The Dutch contingent had been the largest Continental group to attend the Third International Electrodeposition Conference sponsored by the ETS in 1947. He brought the greetings and good wishes of the society to the newly-formed Dutch Electroplaters' Technical Group, and said he hoped it might be possible to arrange a joint meeting with the British Society in Holland next year.

U.S. Interests and World Sulphur Resources

Denial of Agreements with Italy and Sicily

COMMENTING on reports originating in Rome and credited to Calogero Volpe, president of the Italian sulphur organisation which represents Italian sulphur producers, Mr. Clarence A. Snider, president of the Sulphur Export Corporation, New York, denied that the corporation is planning or contemplating any agreements with Italian producers. Mr. Snider said there was no basis for the statement and added that the matter had not been discussed.

39 Years' Supply

Refuting a rumour that sulphur mines in Louisiana and Texas will be nearly exhausted in four or five years, Mr. Snider recalled that the U.S. Bureau of Mines had estimated the life of known "commercial" reserves of sulphur as at 1944, measured in terms of the 1935-44 annual rates of consumption, at 39 years. These do not include sub-marginal reserves and the possible discoveries of new deposits.

The present denial of American interest in the administration of sulphur in Italy recalls a formal investigation, instituted in February, 1947, under the provisions of the Export Trade Act, of various agreements and practices of the Sulphur Export Corporation (Sulexco) regarding its activities as an export trade assocation. The U.S. Federal Trade Commission then recommended to Sulexco to refrain from formulating or participating in agreements with foreign or domestic producers of sulphur. The commission's recommendations were directed principally to certain provisions of separate trade agreements entered into by Sulexco with Italian sulphur producers, one Norwegian producer, and two American producers.

Evidence before the commission purported to show that at various times between 1922 (when Sulexco came into existence) and 1939 the corporation was a party to trade agreements, with two organisations of Italian producers sponsored by the Italian Government, providing for a division of sales in specified export markets on a definite percentage quota basis, and the fixing of prices, terms and conditions of sales. The first agreement was in effect from 1922 to 1932, when the Italian group, the Consorzio Obligotorio per L'Industria Solfifera Siciliana, was dissolved by the Italian Government.

The evidence indicated further that Sulexco had entered into certain trading and patents agreements with other Italian and Sicilian and Norwegian groups, and in America with the Jefferson Lake Sulphur Company and Duval Texas Sulphur Company. These involved agreements on the part of the two latter companies to refrain from competing with Sulexco in export trade in sulphur. The commission concluded that these contracts were unlawful, at least in so far as the two independent companies who were not members of Sulexco were concerned.

Member companies of Sulexco are the Freeport Sulphur Company and the Texas Gulf Sulphur Company, both of New York. The Freeport Sulphur Company began operations in 1913, at Bryan Mound in Brazoria County, Texas; its reserves became exhausted about 15 years ago, and it now produces sulphur from two properties in Brazoria County, and in Plaquemines Parish, Louisiana. The company is considered to be the world's second largest producer of sulphur.

The other member of Sulexco, the Texas Gulf Sulphur Company, ranks as the world's largest producer of native sulphur. During the 25 years it produced 28,124,372 long tons of sulphur, equivalent to approximately 56 per cent of the total U.S. production.

ECA AUTHORISATIONS

THE Economic Co-operation Administration has announced a Marshal Plan aid total for April of over $5000 million, with the addition of $302.2 million in procurement authorisations. Brtain's share in the latter was $127.9 million, authorising her to procure food, fuel, raw materials and machinery. This total was the largest among the countries and areas participating in the European Recovery Programme and brought the United Kingdom's figure for the 13 months past to $1387.7 million.

Among the outstanding items in the U.K authorisations for April, with the figures for the 13-month period, were :—

	April, 1949	April 3, 1948, to April 30, 1949
	(millions of dollars)	
Non-ferrous metals and products		
Copper	—	59.8
Aluminium	8.1	57.4
Lead	0.1	24.1
Zinc	5.2	39.5
Non-ferrous total ...	13.4	180.8
Petroleum and products	—	153.5
Chemicals and related products ...	5.6	34.9
Non-metallic minerals	2.0	13.1
Metallic ores and concentrates ...	0.9	5.8

Home News Items

New Number.—The A.P.V. Co., Ltd., has a new telephone number and telegraphic address: Vandyke 4492-9; Anaclastic, Wesphone, London.

Oils and Fats Prices.—No change will be made in the prices of unrefined oils and fats and technical animal fats allocated to primary wholesalers and large trade users during the 4-week period ending July 2.

Technical Film for Farmers.—A 35 mm. film in colour on "British Agriculture," with a commentary, has just been completed by the agricultural department of Potash, Ltd., under the direction of Dr. G. A. Cowie. It will be available to farming clubs and agricultural discussion societies, etc.

PVC Price Control Ends.—Price control of PVC plastic sheeting came to an end last week-end. This was the effect of the revocation order (S.I. 1076) issued by the Board of Trade, releasing the prices from control at all stages, manufacturing and retail.

New Plasticiser.—Albright & Wilson, Ltd., will soon be in a position to supply commercial quantities of trixylenyl phosphate. This is a useful plasticiser for PVC, cellulose derivatives and other polymers. It is waterwhite, free from odour and has a very low volatility. PVC which has been plasticised with it possesses good electrical and flame-resistant properties.

Oil Firm's Expansion Plans.—Vacuum Oil Company, Ltd., has recently begun an extensive reconstruction programme at its Birkenhead oil blending and packaging plant which suffered considerable damage by enemy action during the war. Considerably increased bulk storage capacity for blended products and a new barrel cleaning and painting plant are to be incorporated. Various sections of the plant will become operative during 1950.

Promising Electronic Development.—The ultrasonic generator of Mullard Electronic Products, Ltd. (THE CHEMICAL AGE, *60*, 521), which was seen by thousands during the British Industries Fair, is going to Manchester where it will be one of the company's exhibits at the Institution of Electronics Exhibition, from July 19 to July 21. The first commercial ultrasonic generator to be produced, it has marked possibilities in experiments in the cleansing of fabrics immersed in water, in fog dispersal, the emulsification of liquids, effecting chemical changes, and in the killing of bacteria.

Formal Opening at Stanlow.—The new Shell chemical plant at Stanlow, Cheshire, will be formally opened on July 20 by Sir Stafford Cripps.

Change of Address.—The London office of Metropolitan-Vickers Electrical Co., Ltd., has been transferred from Number One Kingsway to St. Paul's Corner, 1-3 St. Paul's Churchyard, London, E.C.4. (Telephone: City 5757.)

Jute Research.—The London offices and laboratories of the Indian Jute Mills Association Research Institute will, on June 25, be removed to larger and permanent headquarters at Baltic House, Leadenhall Street, E.C.3.

Coal Production.—Total coal output in Britain last week fell by more than one million tons due to the Whitsun holidays. Comparative figures are: Last week: 3,233 million tons (3,048,600 tons deep-mined, 184,406 tons opencast. Previous week: 4,322,200 tons (4,033,600 tons deep-mined, 288,600 tons opencast).

Gas Cylinder Explodes.—When a cylinder containing liquid sulphur dioxide exploded at Riverside Restaurant, New Brighton, last week, one man received severe burns to the face and four others were rendered unconscious. A chief electrician was mending a refrigerator in the yard when the cylinder on which he was working exploded in his face.

Steel Plant for Wales.—Many classes of steel not previously manufactured in the area are to be produced at new mills and furnaces to be constructed at Llanelly, Carmarthenshire. Plans were approved by the Iron and Steel Board before it disbanded at the end of March. The plant will be smaller than the strip mill at Margam, Glamorganshire, but in conjunction with the cold reduction plant under construction at Trostre, should ensure the future industrial importance of Llanelly.

Control of River Pollution.—The question of pollution of the River Clyde by industrial effluent, including chemical, paper and similar waste, is to be raised in the Commons by Mr. John Rankin, M.P. for Tradeston, Glasgow. The rivers Cart and Kelvin are said to be the main sources of the trouble, and Mr. Rankin is to urge the Secretary of State to institute scientific control to render the effluent harmless. The Kelvin is a particular instance of pollution for which paper mills outside the city area have been blamed.

Overseas News Items

Palestine Refineries Damaged.—Fire on June 8 damaged acid and sulphur plant at Haifa oil refineries.

Synthetic Rubber Development.—The Schkopau synthetic rubber factories in Germany have started production of chloroacetic acid and of catalysts for a new synthetic rubber composition which will be used for therapeutic purposes.

Chemistry and Industry.—A new industrial applications laboratory has recently been established by the Dow Chemical Company at Bay City, Mich. This is a development of a laboratory in Ann Arbor, Mich., where similar work has been carried on for the past ten years.

Radioisotope Service to Continue.—The U.S. Atomic Energy Commission's General Advisory Committee has recommended that distribution of radioactive isotopes to foreign countries shall continue. It had been alleged that the commission had violated the spirit of the law covering atomic research by sending isotopes to Norway for research on jet engines and rockets.

Search for Coking Coal.—If the proposed investigation to locate metallurgical coal deposits in the Godaveri Valley in India proves fruitful, the chances of an iron and steel factory being set up in Madras Province will be greatly advanced. High-grade iron ore deposits have been located by the Geological Survey of India in Sandur and Salem also, in Madras Province.

Atomic Power in South Africa.—British and American experts are to visit Capetown in a few months' time at the invitation of the South African Government to discuss the production of atomic energy. This was announced in the House of Assembly this week by Mr. Louw, Minister of Mines, who stated that for security reasons it was not possible to give full information of South Africa's uranium resources.

Minerals in Australia.—Specimens of radio-active minerals of an unusually high uranium content have been found in the Hart's Range, about 200 miles from Alice Springs in Central Australia, according to the Australian News and Information Bureau, New York. The specimens came from a locality known as Lone Pine, which had been worked for mica. Examination of other deposits in the Hart's Range disclosed uranium materials over a wide area. Samples of ore from the new Hart's Range fields are being sent to the U.S. Atomic Energy Commission for preliminary testing.

New Fire-Resistant Material.—A German engineer in Volkach-am-Main, August Messler, claims to have perfected a new material derived from basalt which is used for fire-resisting gloves and garments.

Paris Drug Requirements.—At the recent Journées pharmaceutiques françaises, which 500 pharmacists attended in Paris, the president, M. Rene Fabre, doyen of the Faculty of Pharmacy, said that about 800,000 francs were spent on penicillin, 500,000 francs on streptomycin and 1.5 million francs on other medicaments daily in Paris hospitals.

Canada's Chemicals.—Canadian chemical industry now comprises more than 1000 plants employing more than 60,000, Mr. J. D. Converse, manager of the chemical division of Canadian Industries, Ltd., told an audience in Ottawa recently. Recalling the output of chemical and allied industries in Canada was worth over $400 million, he said millions of dollars were spent annually to find new chemicals and reduce production costs.

U.S. Sulphur Production Record.—Preliminary statistics for the output of sulphur in the U.S.A. during 1948 show a total of 4,869,210 long tons, an increase of nearly 10 per cent above the previous year. Imports were negligible, while exports, continuing high at 1,262,913 long tons, were slightly lower than in 1947. Sales were up by 175,000 tons and stocks at 1948 were 4 per cent below those of 1947.

Motor Fuel Economy.—M. Raymond Devaux, a French inventor, last week demonstrated a device which he claims reduces a motor-car's consumption of petrol by 40 per cent. The apparatus adds a fine spray of water which is electrolysed into hydrogen and oxygen as it passes into the petrol vapour stream. In a test an 11-h.p. Citroen is stated to have covered nine miles at a good speed on the mixed fuel and the consumption was quivalent to 45 m.p.g.

Labrador Iron Ore.—The new iron ore region in the central part of the Labrador peninsula is stated by the Bureau of Mines, Ottawa, to have an initial reserve of 30 million tons of high-grade ore, and the general geological features indicate that much greater tonnage will be found as surface prospecting and drilling proceed. Operating conditions are favourable for about six months of the year. Although the main market for the ore is stated to be in the area round Pittsburgh, there will also be a possible market in Great Britain and Belgium, the bureau states.

"Extended" Creosote

S. African Method May Double Supplies

A DISCOVERY which, it is believed, will double South Africa's available imported creosote supplies (from 250,000 to 500,000 gal. a year) has been made by the Forest Products Institute in Pretoria. The Union is believed thus to be technically more advanced than the U.S.A. and consequently than the rest of the world. The discovery is that of a "bridging agent" which makes it possible to mix certain mineral fuel oils with creosote. Up till now this has not been possible without causing an asphaltic deposit or sludge.

The news presented on this page comes from our Cape Town Correspondent.

In America certain oils are available which are compatible with creosote, and these have been used for many years in that country, but they are not available in South Africa at present.

* * *

The Union Government's organic products factory at Klipfontein, it is reliably understood, will be made the property of a public utility corporation. The factory was built during the war to manufacture mustard gas and subsequently was adapted to make DDT. A Bill is now in preparation to give effect to the new plan.

* * *

The preliminary clearing and construction work has started in connection with the erection of large extensions to the plant of African Explosives and Chemical Industries. The new plant, which is designed for the manufacture of ammonia and nitrate products, will probably take three years to complete. The increased output of these chemicals should considerably expand the Union's production of explosives and chemicals. There are five factories in the Union licensed under the Explosives Act, two of these between them producing most of the commercial explosives manufactured in the country. In addition, there are two small fireworks factories. While the bulk of the Union's requirements of commercial explosives are made locally, there are a few lines —chiefly fuses for electric detonators— which have to be imported.

* * *

The supply of caustic soda from Britain has not improved, and it is still necessary for the Union Government to make allocations of the amount made available by the British Board of Trade and to import a large proportion of requirements from the U.S.A. and Europe.

Seawater Magnesium

New South African Plant Opened

THE factory four miles north of Saldanha Bay, designed to produce £500,000 worth of salts and metals from sea water annually, started production on June 1. The new plant, the first of its kind in South Africa, is locally financed. With a handling capacity of 5 million tons a day, its annual harvest from the sea will be 100,000 tons of different grades of salt, 36,065 tons of magnesium—sufficient to meet local needs and allow a margin for export—700 tons of potassium, and 200 tons of bromine.

The Vrany Chemical Corporation has built this plant on a 1100 morgen site, part of which is laid out in terraced pans, where the seawater is evaporated. The water is pumped through pipes laid under the breakers, 300 ft. from the shore, and is then distributed through canals to the pans, where a controlled flow maintains a depth of 6 in.

U.S. Machinery

The pans are lined with sun dried clay to prevent seepage. The residue is scraped from the clay and taken to the purifying plants, where it passes through cleaning, electrolytic and solvent processes to extract the various elements. Machinery is being imported from the U.S.A. to convert the magnesium hydroxide obtained in this way into pure magnesium. Many of the pans are being cemented, and overhead framework is being constructed from which the water will be sprayed to induce more rapid evaporation.

Altogether £100,000 worth of building is in progress, including an electricity power plant. The salt produced will be used as food, and in the manufacture of alkalis, glass, soap, plastics, paper, textiles, paint, chlorine, soda ash and other chemicals.

Magnesium, probably the most important of the plant's products, is to be used for making light metal alloys. Potassium is vital to the Union as the basis of many agricultural fertilisers, and bromine is used locally for medical and photographic materials.

Mr. O. Vrany, managing director of the operating company, said recently: "We are pumping large quantities of sea-water daily and there is a possibility that there is gold in it. A Johannesburg company is interested in this and will probably experiment to see whether it is workable or not."

Sea shells and limestone collected on the property have been piled in huge mounds, and will be burned for the extraction of lime. When the plant starts full production it will employ 300 workers, about 30 Europeans and the rest Africans.

Health Safeguards in Factories

Additional Requirements of the New Act

FURTHER provisions to safeguard the health and welfare of factory workers are made in the Factories Act, 1948, which recently came into operation.

This introduces the first alterations and additions to the principal Act (1937). Among these, legislation is now provided forbidding factory work to be undertaken regularly by a young person unless a certificate of fitness (following medical examination) is obtained, the term "young person" being stated to mean in this case a male or female under eighteen years of age, whereas formerly the requirement only applied up to sixteen years.

Moreover, yearly medical examinations are now obligatory, while formerly there was no fixed period for re-examination, although the certificate could be given subject to named re-examination. Factory work can commence before a medical examination, but notification to the factory inspector is required during the first seven days, and work cannot continue beyond 14 days without a certificate of fitness.

In some cases, medical supervision of employees of any age or sex may be obligatory, this provision applying where it is considered that there is risk of injury to health from any susbtance or material brought to the factory to be used or handled, or from any change in the conditions of work, etc., in the factory.

The provisions concerning the suitability of premises for use as factories have been altered. An inspector can now go to a court of summary jurisdiction, and if he satisfies the court that the premises (or part) are in such a condition, or are so constructed or placed, that their use, or intended use, for a process or work is liable to affect the safety, health, or welfare of the employee, an order can be made stopping the carrying on of any process or work, either indefinitely or until the premises have been put into a proper condition. A new point to note is that the use of premises can now be prevented before work is started.

It is noteworthy that whereas formerly a factory could be started without prior notification to an inspector—it was sufficient if a notice was given within the month following the start—now notification of the *intention* to start operations must be given at least one month before starting, so that the inspector can view the premises before work is commenced.

There are certain standards laid down for such things as temperatures in workrooms; ventilation; lighting; sanitary conveniences; washing facilities; accommodation for clothing. The provisions of the 1937 Act have now been altered so that in some cases these standards can be departed from, as in the case of temperature. Ordinarily, the requirement is 60° F., but in some cases a higher or lower standard is allowable.

By the 1937 Act, where work is done standing, sitting facilities must be provided, but this only applied to female employees. Now this requirement is amplified and applies to all employees, male and female alike, where he or she has reasonable opportunities for sitting without detriment to the work on hand. Furthermore, where a substantial proportion of the work can be done sitting, seats (with footrests if considered necessary) must be provided. But this provision does not come into force until October 1, 1950, it probably being recognised that there is difficulty nowadays in providing suitable seats, with also the possibility of a re-arrangement of gangways, etc., working arrangements and so forth, being required.

Eye Injuries

25 p.c. of Total Mishaps

OBSERVATIONS over two years in a U.S. group of chemical plants disclosed that eye injuries represented 25 per cent of all injuries sustained by employees. Effective use is made of this fact in a new manual, "Toxic Eye Hazards," dealing with various safeguards against the many chemicals now used in industrial processes, which has just been announced by the National Society for the Prevention of Blindness, 1790 Broadway, New York.

The manual is the result of research undertaken by the Joint Committee on Industrial Ophthalmology of the American Medical Association and the American Academy of Ophthalmology and Otolaryngology on the effects of various chemicals on the eyes

Types of protective equipment best suited to specific hazards and a standard programme for eye safety from chemical exposure are covered in sections of the book contributed by experts in the fields of industrial opthalmology and safety engineering.

A valuable feature of the 102-page manual are the tables of toxic chemicals and their effects on the eyes, classified under organic and inorganic compounds, detergents and soaps.

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Satisfactions

ALUMILITE & ALZAK, LTD., London, E.C. (M.S., 18/6/49.) Satisfaction May 14, of debentures registered May 17, 1943, and April 14, 1948.

INDUSTRIAL MACHINERY CO., LTD., London, N. (M.S., 18/6/49.) Satisfaction May 12, of debenture registered October 3, 1946.

ARTHUR VERITY & JOHN TURNER, LTD., Sowerby Bridge. (M.S., 18/6/49.) Satisfaction May 11, of debenture registered March 20, 1930.

New Companies Registered

Edward C. Cook & Co. (Northampton), Ltd. (469,421). Private company. Capital: £65,000. Objects: To acquire the business of chemical manufacturers and merchants, etc., carried on as "Edward C. Cook & Company." Directors: E. C. Cook, 4 Park Avenue South, Northampton; and J. H. Lee.

Creline, Ltd. (469,279). Private company. Capital: £100. Manufacturers of chemical resisting lining materials, etc. Subscribers: K. F. Prater, 277 Glyn Road, E.5; and B. J. Crocker.

Douswan Chemicals, Ltd. (469,281). Private company. Capital: £100. Manufacturers of solvents, oils, chemicals, etc. Director: A. A. Aveline. Reg. office: 7 Abercorn Mews, Violet Hill, N.W.8.

Flexible Abrasives, Ltd. (469,333). Private company. Capital: £10,000. Reg. office: 104 High Holborn, W.C.1.

Mury (England), Ltd. (469,396). Private company. Capital: £25,000. Manufacturers of dyes, soaps, etc. Subscribers: O. N. T. Davenport, 15b Marloes Road, W.8; A. A. Maisonneure, and A. Stas.

Chemical and Allied Stocks and Shares

THE railway and other labour troubles have affected sentiment in stock markets, where values in most sections again declined, although there was some recovery from lowest levels. British Funds steadied, helped by a small improvement in 3 per cent Gas Stock. Industrial shares were firmer at the beginning of the week, the improved export trade figures for the past month creating a good impression, although there are many indications that the market abroad has weakened. Courtaulds in their preliminary statement and the Dunlop Rubber chairman at the annual meeting refer specifically to this.

In view of changing conditions in overseas markets, it is being assumed in the City that profits of many companies are unlikely to be maintained this year. On the other hand, in numerous cases this may not have a marked effect on net profits, in view of the large proportion of the gross earnings nominally taken by taxation. There would have to be a big fall in net profits to necessitate a "cut" in dividends of most leading industrial companies. Meanwhile, the fall in share values has been indiscriminate, and numerous upward adjustments seem justified unless there is to be a general trade slump.

As expected, shares of chemical and allied companies continued to move fairly closely with the trend of markets. Imperial Chemical, after being down to close on 44s., had firmed up to 44s. 6d. at the time of writing; Monsanto were 51s. 3d., Fisons 44s., Brotherton 10s. shares 20s. 3d., Amber Chemical 2s. shares 6s. 9d., Boake, Roberts 30s., B. Laporte 5s. units 19s., and Cooper McDougall & Robertson 28s. Awaiting terms of the big new preference share issue, Albright & Wilson 5s. ordinary have been steadier at 28s. 9d. after an earlier small decline. British Oxygen, which is planning a big offer of new ordinary shares, went back to 92s. 6d., but later rallied to 93s. 1½d. Babcock & Wilcox, which has announced that in due course a substantial offer of new preference and ordinary is to be offered, have fallen back to 63s. 6d. When new shares are issued to shareholders they are, of course, offered on attractive terms below the existing market price; but there is often a fair amount of selling of the old shares in order to take up the new.

The 4s. units of the Distillers Co. have been firmer at 25s. 4½d., reflecting market confidence that the year's dividend will be maintained. Borax Consolidated fell back to 51s., before firming up to 51s. 6d., but Ilford 5s. shares have turned easier to 24s. 6d. on the projected new issue. British Plaster Board 5s. shares fell back further to 18s. 6d. before recovering to 19s. 3d. on hopes that last year's dividend rate may be held. Elsewhere, British Aluminium recovered to 45s. 6d. In other directions, Dunlop Rubber were better at 62s. 9d. following the statements at the meeting. Turner & Newall (71s. 6d.) recovered part of an earlier decline, as did Triplex Glass 10s. shares at 18s.

Iron and steel shares reacted further, including those on the nationalisation list, which are now generally well below their scheduled "take-over" prices. Beechams deferred were back to 12s. 6d. Boots Drug

have been around 50s. 6d. reflecting market expectations of good financial results. There were only small movements in oil shares. Shell eased to 61s. 10½d., despite the impressive consolidated figures and the chairman's recent review of widespread development.

British Chemical Prices

Market Reports

THERE has been a fair amount of new business on the industrial chemicals market during the past week although consumers generally, in view of the easier supply position, are covering no more than their current requirements. The movement against contracts continues satisfactory while there appears to be no lessening in the volume of overseas inquiry. Prices are steady and with few exceptions remain unchanged. The makers' price for tartaric acid has been reduced by 10s. per cwt., and a further reduction in the convention quotations for white lead has been announced owing to the decrease in the controlled price of pig lead. Dry white lead is now £11 10s. per ton cheaper and ground white lead £10 10s. per ton cheaper. The new quotation for red lead has yet to be announced. Trade in coal-tar products has been rather quiet with no changes to record. There has been a moderate buying interest for pitch and for creosote oil.

MANCHESTER.—Trading on the Manchester chemical market has regained practically normal conditions after the interruptions arising out of the Whitsuntide holidays. There has been a steady demand for a wide range of dyeing, bleaching, finishing and other textile chemicals and other leading industrial consumers have been pressing for good deliveries under contracts. New home-trade inquiry and actual bookings have been on a fair scale, and a steady movement of supplies on export account has also been reported. While the alkalis and most other heavy chemicals are maintaining a steady front, easiness has developed in the non-ferrous metal compounds in sympathy with the recent drop in the metal prices, and there have also been declines in prices of a number of solvents. (Page 883, this issue.)

GLASGOW.—The Scottish chemical market has shown much improvement during the past week and the volume of business transacted has been on a heavier scale than for some time. Present indications are that this is not a flash in the pan but a reflection on improving conditions. Demand for coal-tar products has been heavy, but supplies have been sufficient. There is nothing of note in the export market.

Underground Dams

New Method of Seepage Control

A NEW means of preventing underground seepage, one of the chief causes of loss and pollution of water, is reported from the U.S.A. It enables a subterranean barrier to be built without excavating, an operation which has previously proved costly and difficult at depth of more than a few feet.

Already in use to check serious loss of water through an earth dam on the Santa Ana river, California, the new method is marketed by the Shell Oil Co., New York, under the trade name of Shellperm.

The process employs an emulsion of asphalt in water, which is pumped under low pressure through a metal pipe driven into the ground. Emerging from the pipe, the emulsion spreads out roughly in the form of a ball. Chemicals mixed with the emulsion then cause the asphalt to coalesce, producing a mass impermeable to water.

Following the first injection, the pipe is raised, and additional Shellperm is pumped down to form a second impermeable mass. After repeated injections have produced a vertical asphalt column, the pipe is moved and additional injections are made to create another column. The process is repeated until abutting or overlapping columns form an underground dam.

ROYALTY-FREE PROCESS

PAVING the way for broader use of electroplated magnesium products, the Dow Chemical Company, Midland, Michigan, has announced the removal of all royalty fees from the plating process it brought to commercial development a few months ago. The only stipulation of the new licence arrangement is that the donors should be permitted free access to any process improvements which may be made by the licensee. This royalty-free concession is applicable only in the U.S.A.

The electroplating process is expected to have a far-reaching effect on the utilisation of magnesium because it offers an easy and practical method for plating. Simple immersion of mechanically and chemically cleaned magnesium parts in a zinc salt bath is the only extra treating step necessary, after which the standard electroplating baths in common use on other metals can be used.

Fine Film Measurement.—An accuracy of 4/10,000 in. is achieved on a new electrical gauge devised by instrument engineers at Fort Dunlop for recording the thickness of rubber film on tyre cord.

Patent Processes in Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of specifications accepted will be obtainable, as soon as printing arrangements permit, from the Patents Office, Southampton Buildings, London, W.C.2, at 2s. each. Higher priced photostat copies are generally available.

Complete Specifications Accepted

Separation of hydrocarbons.—Anglo-Iranian Oil Co., Ltd., S. F. Birch, and J. W. Hyde. Oct. 23, 1943. 620,387.

Transfer of heat to boiling fluids.—H. K. Allbright. Feb. 8, 1944. 620,388

Stabilisation of tetrafluoroethylene.—E. I. Du Pont de Nemours & Co. Feb. 15, 1943. 620,296.

Cyclic process for the preparation of acetylenic alcohols.—Commercial Solvents Corporation. Nov. 5, 1943. 620,298.

Method of preparing phenol-formaldehyde resin compositions, the phenol-formaldehyde resin compositions resulting therefrom and objects coated therewith.—Heresite & Chemical Co. April 22, 1944. 620,565.

Vacuum dehydration.—Distillation Products, Inc. Oct. 18, 1944. 620,573.

Process for the removal of impurities of an organic nature from aqueous solutions of sugars.—Meijer's Dextrinefabrieken N.V. O.J. Jan. 9, 1941. 620,581.

Regenerating adsorbent material.—H. E. Zankey. Oct. 5, 1944. 620,397.

Methods of and apparatus for treating textiles and like materials.—Morton Sundour Fabrics, Ltd., R. S. E. Hanney, and W. Kilby. Jan. 14, 1946. 620,584.

High vacuum process and apparatus.—Distillation Products, Inc. March 2, 1945. 620,485.

Removal of sulphur compounds from industrial gases.—Koppers Co., Inc. Aug. 17, 1944. 620,307.

Contacting liquids with gases or vapours.—I.C.I., Ltd., and O. G. Dixon. Feb. 28, 1946. 620,402.

Liquid multiple vitamin preparation and method of preparing same.—Abbott Laboratories. May 5, 1945. 620,587.

Removal of sulphur from coke and/or iron ore.—J. Miles & Partners (London), Ltd. May 7, 1946. 620,588.

Linear polyesters.—J. G. N. Drewitt, and J. Lincoln. May 20, 1946. 620,494.

Process for the manufacture of double or triple superphosphate.—Sturtevant Engineering Co., Ltd., H. Richardson & Co. (York), Ltd., J. T. Procter, and A. Ogilvie. May 21, 1946. 620,590.

Explosives of the organic peroxide class.—G. E. Mavrodi. (J. Argani.) July 15, 1946. 620,498.

Urea formaldehyde resinous materials.—British Resin Products, Ltd., J. D. Morgan, and J. F. Williams. July 18, 1946. 620,412.

Preparation of salts of streptothricin.—Merck & Co., Inc. Aug. 24, 1945. 620,413.

Process of preparing salts of streptomycin.—Merck & Co., Inc. Aug. 24, 1945. 620,415.

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Continuous manufacture of glass.—Soc. Anon. des Manufactures des Glaces et Produits Chimiques de St.Gobain, Chauny & Cirey. Jan. 16, 1946. 620,355.

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